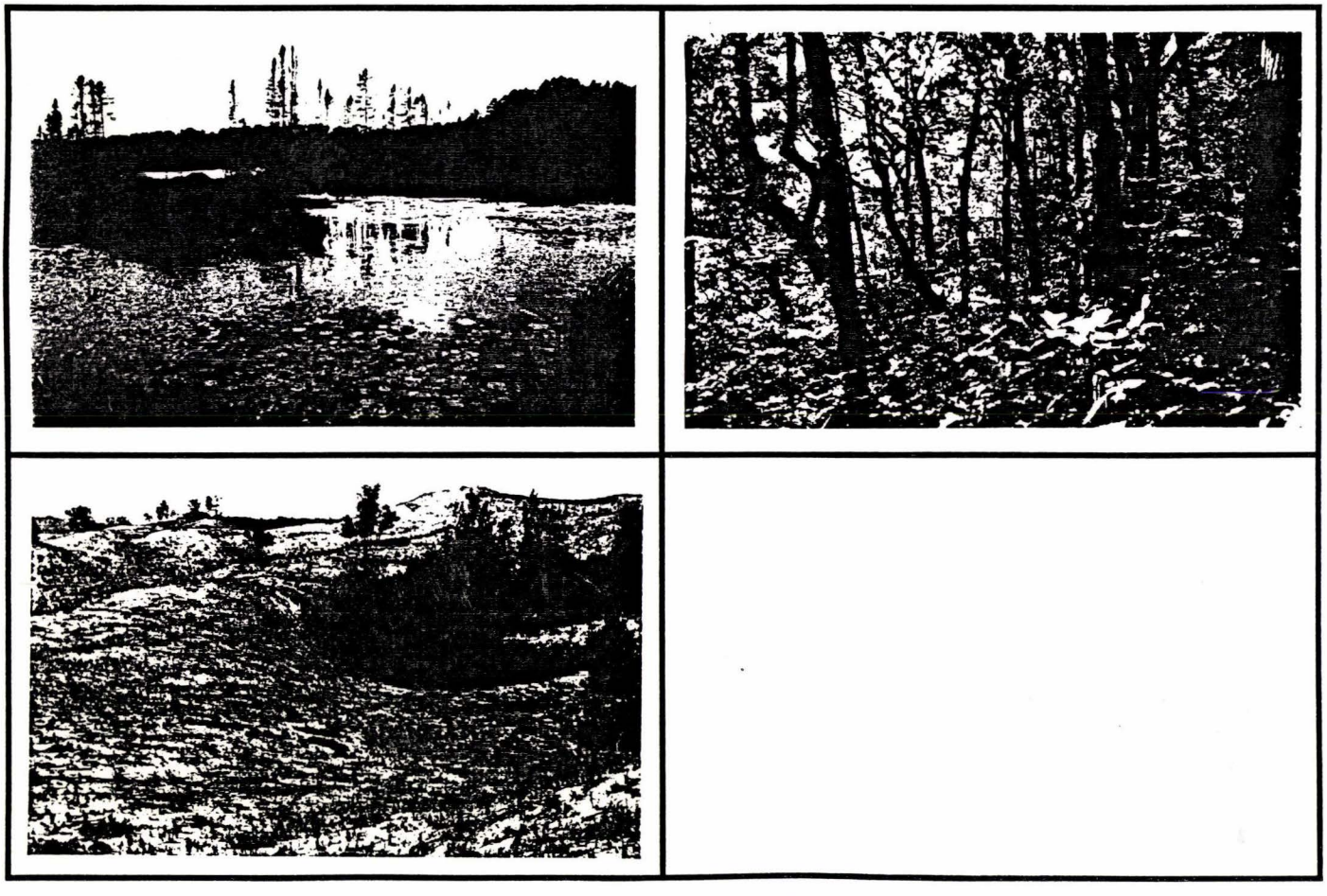
Establishing a Region-Wide Network of Representative Research Natural Areas (RNAs): AN ASSESSMENT FOR THE EASTERN REGION'S RNA FRAMEWORK

DRAFT

10 April 2000



ABBREVIATIONS USED

ATV – all terrain vehicle
CDS – combined data system
CFR – Code of Federal Regulations
CRNA – candidate research natural area
ECOMAP – ecological unit mapping
ECS – ecological classification system
ELT – ecological landtype
EO – element occurrence
FGDC - Federal Geographic Data Committee
FS – Forest Service
FSM – Forest Service Manual
GIS – geographic information system
LT – landtype (also known as ecological landtype)
LTA – landtype association
RNA – research natural area
SAF – Society of American Foresters
SNA – state natural area
TNC – The Nature Conservancy
USDA – United States Department of Agriculture
USFS – United States Forest Service
USNVC – United States National Vegetation Classification

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PREFACE

The Regional RNA Assessment was completed as a cooperative agreement between the USDA Forest Service (Eastern Region / North Central and Northeastern Research Stations) and The Nature Conservancy, Midwest Regional Office. The purpose of the Regional RNA Assessment was to gather information on the current status of Research Natural Area (RNA) representation of ecological systems across the Eastern Region and to provide information for guiding future RNA selection and establishment. This information is provided to assist planning by national forests in the region, both individually and collectively. We hope this information will also be useful for conservation planning by other federal, state, and private agencies and organizations.

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ACKNOWLEDGMENTS

This report is the result of assistance from a wide array of individuals from many organizations. Direct funding support for this project came from the USDA Forest Service Washington Office Special Commitment Funds for RNA projects via the North Central Research Station, the USDA Forest Service Washington Office Ecosystem Management Fund, and the USDA Forest Service Eastern Region Research Natural Area Program. The Nature Conservancy provided in-kind support for Don Faber-Langendoen and Mark Anderson, and partial support for Kristin Snow.

Mark Nelson of North Central Research Station provided GIS support and assistance for this project.

Assistance from individual national forests came from: Allegheny (Brad Nelson), Chequamegon and Nicolet (Marj Brzeskiewicz, Dave Hoppe, Linda Parker, Quita Sheehan), Chippewa (John Almendinger, Dave Shadis, Al Williamson), Green Mountain and Finger Lakes (Diane Burbank), Hiawatha (Donna Irenata, Jan Schultz), Hoosier (Steve Olson), Huron-Manistee (Alix Cleveland, Pat Fowler), Mark Twain (Lynda Richards), Monongahela (Tom Demeo), Ottawa (Sarah Mase, Karen Nash, Sue Trull), Shawnee (Beth Shimp, Andy Rorick), Superior (Robin Vora, Al Williamson), Wayne (Rosemarie Boyle), and White Mountain (Steve Fay).

Several individuals completed pilot studies for their national forest; the information they provided was very helpful for this project: Diane Burbank (Green Mountain), Steve Fay (White Mountain), Dave Hoppe and D. Craig Beardsley (Nicolet), Linda Parker (Chequamegon), Manmeet Patheja (Huron-Manistee), and Beth Shimp (Shawnee).

We also want to thank Marilyn Ortt for her help with information about the Wayne National Forest.

Information was received from Natural Heritage Programs and State Natural Area Programs in the following states: Illinois, Indiana, Maine, Michigan, Minnesota, Missouri, New Hampshire, New York, Ohio, Pennsylvania, Vermont, West Virginia, and Wisconsin. In particular, in the Lake States we want to thank Pat Comer of the Michigan Natural Features Inventory; Norm Aaseng, Chel Anderson, Carmen Converse, Robert Dana, and Kurt Rusterholz of the Minnesota County Biological Survey and Natural Heritage Program; and Eric Epstein and Randy Hoffman of the Wisconsin Natural Heritage Program. In the Central States, we thank Terry Campos and Keith Mitchell of the Illinois Natural Heritage Database Program; Ron Hellmich and Mike Homoya of the Indiana Natural Heritage Data Center; Dorothy Butler, Karen Kramer, Mike Leahy, and Tim Nigh of the Missouri Department of Conservation; and Greg Schneider of the Ohio Natural Heritage Database. In the Eastern States, we thank Dan Sperduto of New Hampshire, Eric Sorenson of Vermont, Gary Fleming of Virginia, and Dean Walton of West Virginia.

Assistance also came from The Nature Conservancy Field Offices throughout the region. We thank Max Hutchison in Illinois, Kim Herman and Doug Pearsall in Michigan, Kim Chapman in Minnesota, Blane Heuman in Missouri, Steve Sutherland in Ohio, and Nancy Braker and Jude McCall in Wisconsin. Mark Anderson of The Nature Conservancy Eastern Regional Office provided information for the eastern states.

For assistance in The Nature Conservancy's Midwest Regional Office we thank Ethan Perry for substantial help with writing and editing drafts of several national forest reports, Jennifer Hall for helping with every aspect of this project and for reviewing the documents, Donna Riggs for data management assistance, and Hal Watson for GIS assistance. Additional assistance was provided by Kathy Heise, Penny Kluetz, Sue Lietz, and Tina Scupien of the North Central Research Station.

Helpful review comments were provided by Tom Crow, Eric Gustafson, and Lucy Burde (North Central Research Station); Sam Emmons, Dain Maddox, and Eunice Padley (Eastern Regional Office); Tom Wagner (Superior National Forest); Mike Miller (Chequamegon-Nicolet National Forest); and Patricia Parr (Oak Ridge National Laboratory).

EXECUTIVE SUMMARY

Research natural areas (RNAs) of the USDA Forest Service are lands that are permanently protected for the purposes of maintaining biological diversity, conducting non-manipulative research and monitoring, and fostering education. Land management planning for RNAs is directed by the 36 Code of Federal Regulations related to land planning and land uses, the Forest Service Manual 4063, and other documents. In the Eastern Region, two frameworks guide the identification and establishment of additional research natural areas (RNAs) and the ability of the national forest to contribute to the national network of RNAs. One framework is contained in the Eastern Regional Guide (USDA Forest Service 1983c) as a list of targets for RNAs based on Society of American Foresters (SAF) forest cover types. Another framework is the Regional RNA Framework (drafted in 1995 and presented in this document).

This document briefly reviews current representation of SAF cover types based on the Regional Guide's targets; describes the Regional RNA Framework for terrestrial (upland) and palustrine (wetland) ecosystems; and presents the findings of the Regional RNA Assessment based on the Regional RNA Framework.

REGIONAL GUIDE

The Regional Guide's (USDA Forest Service 1983c) targets for RNAs are the representation of SAF cover types in each of 4 subregions (informally referred to as Eastern, Central, New England, Lake States) of the Eastern Region. Targets are listed by priority based on whether the cover types are unrepresented in an RNA or are represented once or twice. When the targets were drafted in January 1982, there were 12 established RNAs in the Eastern Region. Since then, 31 RNAs have been established adding SAF cover types to the RNA network. A summary of the current representation of SAF cover types in the 43 established RNAs is given by subregion. Acreage information is summarized by RNA for each SAF cover type to help evaluate whether the SAF cover types are represented and not just present in token amounts.

REGIONAL RESEARCH NATURAL AREA FRAMEWORK

The Regional RNA Framework for representation of ecosystems was developed to help meet the objectives of the national RNA Program (FSM4063, 36CFR219, etc.). The Framework provides an approach for representing examples of the ecosystems that occur on national forest lands. Terrestrial and palustrine ecosystems to represent are defined using ecological units in combination with natural communities. Representation of ecological units is at the level of **subsection**, a level of the National Hierarchy of Ecological Units (ECOMAP 1993, McNab and Avers 1994), corresponding to major landforms that have a similar geologic structure and cover tens to thousands of square miles. Representation of natural communities within these subsections is at the **alliance** level, one level of The Nature Conservancy's U.S. National Vegetation Classification (USNVC, Grossman *et al.* 1998). Alliances characterize existing vegetation of both forested and non-forested communities at a scale that emphasizes the patterns of dominant and characteristic species of the uppermost layer of the vegetation. A Regional RNA Framework for aquatic systems has not been developed. However, we have included classification information for aquatic ecosystems for national forests to consider in the representation of aquatic systems in RNAs.

The Regional RNA Framework for a network of representative RNAs recognizes that other protected natural areas may help meet the goals of the RNA network. These other areas are called **RNA-equivalents**. Areas are considered to be RNA-equivalents if they have a level of biodiversity protection and management for natural processes as high as that for RNAs. Typical RNA-equivalents identified in various states of the Eastern Region include State Natural Areas (SNAs) and preserves of The Nature Conservancy, as well as portions of some designations on lands managed by the Forest Service, such as Wilderness areas.

The purposes of RNAs, among others (FSM4063), are to preserve and maintain the biological diversity of natural landscapes, ecosystems, and species, and to serve as baselines for comparison to manipulated ecosystems. Therefore, for an occurrence of an alliance in a subsection to represent that alliance-subsection combination (ecosystem), it must be of sufficient quality to contain typical species and processes of the community type and to have a good chance of lasting in good condition into the future. A proposed Natural Heritage Program ranking system for natural community occurrences is used to rank the long-term quality/viability of alliance examples on RNAs and RNA-equivalents. The criteria for quality/viability are size, condition (species composition, structure, and process), and landscape context.

REGIONAL RNA ASSESSMENT

Based on the Regional RNA Framework, an RNA Assessment was conducted for the entire Eastern Region. We provide background information, assessment methods, assessment results for each national forest, and suggestions for how national forests might use this information.

The RNA Assessment provides information to answer the following questions:

1. What ecosystems are found on national forest lands?

The first step of the assessment was to determine which subsections occur on each national forest in the Eastern Region, and which alliances occur on national forest land in each of these subsections, resulting in a list of alliance-subsection combinations (ecosystems to represent). An assessment for Midewin National Tallgrass Prairie was not included in this assessment because the National Prairie had not yet been established when the assessment was initiated. The aquatic components of the assessment are missing; however, representation of aquatic resources is desired.

2. What is already represented?

The next step was to determine how many alliance-subsection combinations (ecosystems to represent) are currently represented by an RNA or RNA-equivalent. We listed the subsection(s) and alliance(s) that occur on each RNA and RNA-equivalent and ranked the quality/viability of each alliance occurrence. This rank takes into account the size, condition, and landscape context of the occurrence. A high-quality occurrence (A- or B-ranked) of an alliance on an RNA or RNA-equivalent is considered to represent that alliance in that subsection. Candidate RNAs were not included in the assessment, but can be evaluated using the same quality/viability ranking process.

3. What is not represented?

The combined information from the first two steps of the assessment indicates which alliances-subsection combinations occurring on national forest land are missing from representation by RNAs or RNA-equivalents. In this assessment, the alliance-subsection combination is not represented, even if that combination occurs within an RNA or RNA-equivalent, if it was not a high quality (A- or B-ranked) occurrence. We provide the procedure for ranking alliance occurrences to determine if they can represent missing community components in a subsection.

4. How might gaps in representation be prioritized?

Building a network of representative RNAs over time may involve prioritizing the alliance-subsection combinations that are unrepresented. Possible ways to set priorities are explained. Addressing gaps in representation might include emphasis on those subsections that contain a high percentage of national forest land, those that make up a large percentage of the national forest's land, or those where the representation of alliances is low. Within a subsection, representation of unrepresented alliances may also be prioritized by emphasizing certain alliances, such as those which were historically more widespread over the landscape (*i.e.*, matrix alliances), those with a geographic distribution primarily within the province (i.e., endemic alliances), those that include rare associations, those at risk, or those for which a reference ecosystem is particularly needed.

IDENTIFYING AND SELECTING SITES TO FILL GAPS IN REPRSENTATION

Identifying and selecting sites to fill gaps in representation can be accomplished in a number of ways. Included in this document are alternative approaches to identifying and selecting sites, screening techniques to determine which site or sets of sites would be proposed for RNA designation, and RNA selection criteria.

PRODUCTS OF THE ASSESSMENT FOR EACH NATIONAL FOREST ARE:

1. a) a list of subsections on national forest land,
   b) a list of alliances on national forest land in each subsection
2. a matrix (table) of alliances by subsection (ecosystems to represent) showing high- (A- or B-ranked) and low- (BC- or C-ranked) quality occurrences of alliances on RNAs or RNA-equivalents in each subsection,
3. a summary of what is missing from the RNA network, including a list of alliances that are unrepresented forest-wide,
4. suggestions for prioritizing unrepresented alliance-subsection combinations, and
5. computerized (GIS) maps of RNA boundaries

PRODUCTS OF THE ASSESSMENT FOR THE EASTERN REGION ARE:

1. a) a list of national forests by Province
   b) a list of RNAs and RNA-equivalents by subsection
   c) a list of endemic alliances by Province
2. a summary of alliance-subsection combinations (ecosystems) already represented in RNAs and RNA-equivalents by national forest
3. computerized (GIS) maps of RNA boundaries for the Eastern Region
4. a matrix (table) of subsections by alliances for the entire Eastern Region (ECOMAP) [not yet completed]

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I. INTRODUCTION

The Research Natural Area (RNA) Program of the USDA Forest Service has contributed to the protection of biodiversity and provided sites for monitoring and research since 1927 when the first Forest Service RNA was established. Currently over 400 RNAs have been established nationally. As of September 1999, 43 have been established in the Eastern Region (Region 9).

Along with other regional RNA programs (*e.g.*, USDA Forest Service 1993, USDA Forest Service 1995), the Eastern Region has reviewed planning for additional RNAs to fulfill the mandates of the Forest Service Manual 4063 and 36 Code of Federal Regulation (CFR) 219 and 36CFR251, and to contribute toward a national network of RNAs.

In the first several sections of this document, we review the purposes of the Forest Service RNA Program, list the important directives that call for a national network of both representative and distinctive RNAs, and summarize the two frameworks guiding the selection of RNAs in the Eastern Region (the Regional Guide and the Regional RNA Framework). We then describe how we conducted an assessment using the Regional RNA Framework.

The results of the assessment are presented for each national forest (but not Midwin National Tallgrass Prairie, as it had not been established when the assessment began). We summarize what terrestrial and palustrine (wetland) ecosystems occur on national forest lands, what ecosystems are represented by established RNAs and areas with a protected status equivalent to RNAs (we call these RNA-equivalents), and what ecosystems are missing from the RNA network. A brief summary of the results across all national forests in the Region is given in Section VI.F. It may be helpful in the future to conduct a more detailed summary of results across the region and by sub-region or province. We provide alternative priority-setting approaches to address ecosystems missing from the RNA network as well as ways to identify, screen, and select additional RNAs.

We also include information pertinent to the representation of aquatic ecosystems in RNAs. After the development of a regional aquatic framework has been developed, it will be useful to assess what aquatic ecosystems occur on national forest lands, what aquatic ecosystems are represented by established RNAs and RNA-equivalents, and what aquatic ecosystems are missing from the RNA network.

In this assessment we have given specific meanings to several general terms (*e.g.*, represent, quality). The Glossary defines our specific use of these terms.

II. PURPOSE OF THE RNA PROGRAM

The Forest Service Manual defines Forest Service research natural areas as follows (USDA Forest Service 1994):

> "Research natural areas are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. Research natural areas are for non-manipulative research, observation, and study. They also may assist in implementing provisions of special acts, such as the Endangered Species Act and the monitoring provisions of the National Forest Management Act."

The Forest Service Manual (USDA Forest Service 1994) also provides clear goals for the RNA network:

> "The objectives of establishing research natural areas are to:
>
> 1. Preserve a wide spectrum of pristine representative areas that typify important forest, shrubland, grassland, alpine, aquatic, geological, and similar natural situations that have special or unique

characteristics of scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.

2. Preserve and maintain genetic diversity.
3. Protect against serious environmental disruptions.
4. Serve as reference areas for the study of succession.
5. Provide onsite and extension educational activities.
6. Serve as baseline areas for measuring long-term ecological changes.
7. Serve as control areas for comparing results from manipulative research.
8. Monitor effects of resource management techniques and practices."

Until recently, the primary focus of RNA selection and establishment in the Eastern Region has been on areas with distinctive features. Recent efforts have expanded the focus to include the representation of the range of ecosystems, from rare to common community types. While all represented ecosystems contribute to the biodiversity protection goals of the RNA Program, it is the common community types that can best function as baselines or reference areas for the monitoring and research objectives of RNAs.

III. EVALUATING THE NEED FOR ADDITIONAL RNAS

Distinctive (unique, special) and representative RNAs are both an important part of the national network of RNAs. The directives to include examples of typical and widespread, as well as special or unique, ecosystems in a national network of Research Natural Areas (RNAs) are not new. However, it is true that initially more emphasis has been placed on establishing RNAs to protect unique areas than on representing relatively unmodified examples of common or widespread ecosystems. To complete a network of RNAs that includes the wide array of ecosystems (distinctive and widespread) found on national forest lands, the emphasis has shifted to representation of common ecosystems. This shift in emphasis responds to the need for baseline ecosystems to monitor the effects of resource management. RNAs representing common ecosystems can provide this baseline or reference area function.

III.A. Authority/Policy

What are the national or regional directives that provide the authority or set the framework for including representative ecosystems in the RNA network? The following sources provide background and the legal basis for developing a network of representative and distinctive RNAs.

(1) U.S. Department of Agriculture, Forest Service 36 Code of Federal Regulations

219 Land Planning, National Forest System Land and Resource Management Planning
219.25 Research Natural Areas.

"Forest planning shall provide for the establishment of Research Natural Areas (RNAs). Planning shall make provision for the identification of examples of important forest, shrubland, grassland, alpine, aquatic, and geologic types that have special or unique characteristics of scientific interest and importance and that are needed to complete the national network of RNA's. Biotic, aquatic, and geologic types needed for the network shall be identified using a list provided by the Chief of the Forest Service. Authority to establish RNAs is delegated to the Chief at 7 CFR 2.60(a) and 36 CFR 251.23. Recommendations for establishment of areas shall be made to the Chief through the planning process."

251 Land Uses, Miscellaneous Land Uses
251.23 Experimental Areas and Research Natural Areas.

"The Chief of the Forest Service shall establish and permanently record a series of areas on National Forest land to be known as experimental forests or experimental ranges, sufficient in number and size to provide adequately for the research necessary to serve as a basis for the management of forest and range land in each forest region. Also, when appropriate, the Chief shall establish a series of research natural areas, sufficient in number and size to illustrate adequately or typify for research or educational purposes, the important forest and range types in each forest region, as well as other plant communities that have special or unique characteristics of scientific interest and importance. Research Natural Areas will be retained in a virgin or unmodified condition except where measures are required to maintain a plant community which the area is intended to represent. Within areas designated by this regulation, occupancy under a special-use permit shall not be allowed, nor the construction of permanent improvements permitted except improvements required in connection with their experimental use, unless authorized by the Chief of the Forest Service."

(2) Forest Service Manual 4063 (USDA Forest Service 1994)

Forest Service Manual (FSM) 4063 addresses research natural areas.

4063 - RESEARCH NATURAL AREAS. "Research natural areas are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. Research natural areas are for non-manipulative research, observation, and study. They also may assist in implementing provisions of special acts, such as the Endangered Species Act and the monitoring provisions of the National Forest Management Act."

Of particular relevance are the following sections (see Appendix I):
4063.01 Authority
4063.02 Objectives
4063.03 Policy
4063.04 Responsibility
4063.05 Definitions
4063.2 Selection

Amendment No. 4000-94-2, Effective May 4, 1994, delegated the responsibility (formerly reserved to the Chief) to the Regional Foresters, with concurrence of Station Directors, to approve new research natural areas and to sign the implementing designation order (see FSM4063.04b).

(3) National Research Natural Areas Strategy--[enclosure with letter of July 19, 1993 from F. Dale Robertson to Regional Foresters, Station Directors, Area Director, and International Institute of Tropical Forestry (IITF) Director] [Excerpt from the National Research Natural Areas Strategy Appendix (Specific Actions and Opportunities)]

"Strategy 1. Promote linkages of the Research Natural Areas Program with efforts to implement ecosystem management.

> Goal B. 1. Work with ecosystem management efforts to develop priorities for RNAs, including addition of terrestrial and aquatic ecosystems to the Program, and emphasizing ecosystems and situations where RNAs would be useful as reference areas."

(4) Federal Committee on Ecological Reserves--A Directory of Research Natural Areas on Federal Lands of the United States of America (1977)

Section II states that ... "there have been two primary purposes for developing a comprehensive and representative system of Research Natural Areas:

1. To preserve a representative array of all significant natural ecosystems and their inherent processes as baseline areas. This action provides a potential range of diversity, including common, rare, and endangered species or disjunct populations.

2. To obtain through scientific education and research, information about natural system components, inherent processes, and comparisons with representative manipulated systems."

(5) Preparing for the Future--FS-503 (1992)

"The Forest Service's national network of more than 250 RNAs is designed to contain unique ecosystems as well as a representative array of widespread ecosystem types."

(6) Regional Guide for the Eastern Region (1983)

"The Forests are directed to work with National Forest Research Units in locating, evaluating, and establishing research natural areas (RNAs) based on the priorities shown in table 3-21. In addition, the Forests are encouraged to work with State and private conservation organizations in the identification of potential RNAs" [page 3-107]

Page 3-109 lists "Targets for locating, evaluating, and establishing Research Natural Areas for the Eastern Region, January 1982" using Society of American Forester Numbers and Forest Cover Types. Priorities are assigned Priority 1 (unrepresented forest cover types), Priority 2 (forest cover types represented once), and Priority 3 (forest cover types represented twice). Forest cover types are listed separately for subgeographic areas within the region:

- Chippewa, Superior, Nicolet, Chequamegon, Ottawa, Hiawatha, and Huron-Manistee National Forests
- Green Mountain and White Mountain National Forests
- Wayne, Allegheny, and Monongahela National Forests
- Hoosier, Shawnee, and Mark Twain National Forests

Table 3-21 of the Regional Guide is provided in Appendix II of this document.

(7) Ecosystem Management Strategies for The Northeastern and Midwestern National Forests, A Report to the Chief of the Forest Service (September 1992)

page 4, Section 2: Protecting and restoring special and unique ecosystems

"how much is enough?....We answer this question by mapping the landscape by Ecological Units, and then determining the relative scarcity or abundance of non-manipulated ecosystems within these units."

"We will develop and use an ecological inventory to help prioritize how we identify and designate Research Natural Areas across the range of ecological types in the Eastern Region."

III.B. Guidance for RNA selection

There are two frameworks that provide guidance for additional RNAs needs in the Eastern Region. Both are important to the identification, evaluation, designation, and management of areas as RNAs in the Eastern Region. Both address RNA objectives by contributing to biodiversity protection and by providing reference ecosystems or "controls" for management and research purposes. As part of the justification for establishing an RNA, the RNA Establishment Record should show how the RNA relates to both frameworks.

The first framework is given in the **Regional Guide** (USDA Forest Service 1983c, Table 3-21; reproduced here in Appendix II). The goal for the RNA network based on this framework is to include one or more examples of Society of American Foresters (SAF) cover types in each subregion.

The sccond framework that the Eastern Region recognizes was developed to help meet the broad representational objectives of the national RNA Program. The **Regional RNA Framework** bases its representation on both ecological units and on natural communities. The framework for representation takes into account the physical-biological interactions important to ecosystem function. The framework that has been developed for terrestrial and palustrine (wetland) systems is based on the National Hierarchy of Ecological Units (subsections), and provides for the representation of forested and non-forested communities (alliances) within subsections found on national forest lands. The Regional RNA Framework has not been developed for aquatic ecosystems, although representation of aquatic systems in RNAs is recognized as important. Ideally, an aquatic framework will provide for representation of aquatic communities and/within aquatic ecological units.

Both the Regional Guide and the Regional RNA Framework are factors to consider when evaluating the need for additional representative RNAs, and the national forest's ability to contribute to the national network of RNAs. Rare or distinctive ecosystems, as well as widespread or common ones, are part of the national RNA network.

Other Forest Service regions have frameworks for representation of ecosystems. While the frameworks differ among regions, they are similar in basing representation on mapped ecological or geographic units and on natural community elements (Appendix III).

IV. REGIONAL GUIDE

The Regional Guide (USDA Forest Service 1983c) presents SAF cover type targets for 4 subregions (Eastern, Central, New England, Lake States) of the Eastern Region (Appendix II). Targets are listed by priority based on whether the cover types are unrepresented in an RNA or are represented once or twice. When the targets were drafted in January 1982, there were 12 established RNAs in the Eastern Region. Since then, 31 RNAs have been established adding SAF cover types to the RNA network. A summary of the current representation of SAF cover types in the 43 established RNAs is provided in Appendix IIA. Acreage information is summarized by RNA for each SAF cover type to help evaluate whether the SAF cover types are represented and not just present in token amounts (Appendix IIB).

V. REGIONAL RNA FRAMEWORK

The Regional RNA Framework provides guidance to develop a network of Research Natural Areas (RNAs) and other protected natural areas (called RNA-equivalents; see page 13 [check this on final version] and Glossary) that represents the ecosystems that occur on national forest lands within the region. The ecosystems are defined as each natural community within each ecological unit on national forest land. Thus, the Regional RNA Framework provides for representation of:

- ecological units
- natural communities --terrestrial, palustrine, (and aquatic)--within these units

V.A. Development of the Regional RNA Framework

The Eastern Regional RNA Framework, as developed to date, addresses representation of terrestrial (upland) and palustrine (wetland) ecosystems. The Framework has not yet addressed representation of aquatic ecosystems (*e.g.,* lakes, rivers, aquifers). The Regional RNA Framework, as developed for terrestrial and palustrine ecosystems, is based on units of the National Hierarchy of Ecological Units (ECOMAP 1993) and units of The Nature Conservancy's U.S. National Vegetation Classification (USNVC, Grossman *et al.* 1998). As described below, The National Hierarchy of Ecological Units is an ecological land classification that distinguishes landscape ecosystems and The USNVC distinguishes existing natural communities. Both classifications are hierarchical. Both classifications are relatively new and undergoing refinement. However, each has been widely reviewed and is currently being used at state and federal levels.

Pilot studies

In the early 1990's, the Regional RNA Committee (RNA Coordinators from each national forest along with North Central and Northeastern Research Station RNA field representatives) discussed a vision for the network of RNAs: balancing the RNA program emphasis on representative as well as distinctive types, using ecosystems as the basis for RNA needs, and using the ecological classification system to define RNA representation.

By 1993 a proposal was developed that presented four alternatives for RNA representation—(1) representing a percentage of each subsection, (2) representing a percentage of each landtype association, (3) representing the natural communities (alliances) within each subsection, and (4) representing the natural communities (alliances) within each landtype association. Six national forests (Chequamegon, Nicolet, Huron-Manistee, White Mountain, and Green Mountain) conducted pilot studies that explored how many representational units would be identified based on each the four alternatives, and how many of these units were already represented by existing RNAs and other natural areas. On the basis of the pilot results, the Regional RNA Committee proposed the Regional RNA Framework based on alternative (3)--representing alliances within subsections. This option was chosen for several reasons. First, subsections had been mapped for all national forests, whereas landtype associations were not available for some national forests. Second, use of subsections alone did not insure that the full range of biological diversity within the subsection would be represented within an RNA selected to represent the subsection. And third, the number of alliance-landtype association combinations to represent was very high and, from a practical standpoint, untenable compared to the number of alliance-subsection combinations.

Funding the RNA Assessment

In FY 1996, the Regional RNA Program obtained $10,000 from the Washington Office to conduct an assessment, based on the Regional RNA Framework, to determine which alliance-subsection combinations are present and protected on national forest lands. To obtain these competitive funds, the Regional Office provided a match of $10,000, as did The Nature Conservancy. To enlist help gathering and organizing the display of information, a cooperative agreement was set up with The Nature Conservancy in 1996. Additional funding was received in FY 1998 ($8,000) from the Washington Office to complete the Assessment. The Regional RNA Program also contributed to the RNA Assessment.

V.B. Ecosystems to represent

The framework for representative RNAs is designed to represent the range of natural communities at the alliance level occurring in ecological units at the subsection level. *Specifically, the ecosystems to represent are each alliance in each subsection that occurs on national forest land.* A typical RNA includes several alliances occurring together on the landscape. Thus, each representation of an alliance-subsection combination does not mean a separate RNA.

Using the National Hierarchy ecological unit of subsection in combination with alliances provides a framework that considers potential vegetation (National Hierarchy) and current vegetation (community classification). The intent is not to merge the two classifications, but rather to make use of both classifications, and thus make use of the strengths that each offers.

National Hierarchy of Ecological Units

The National Hierarchy of Ecological Units is a system of mapped ecological units (Table I, see ECOMAP 1993, McNab and Avers 1994, and Keys *et al.* 1995). The land units are distinguished by both abiotic and biotic characteristics, including climate, geological parent materials, soils, landforms, local topography and aspect, and potential natural vegetation. The units also represent hypotheses about the way in which the ecological processes structure ecosystems, including responses to natural disturbances and management (Albert 1995). The land units are arranged in a hierarchy based on spatial scale in order to be useful at different scales of management and conservation.

The National Hierarchy was adopted by the Forest Service to be used in national forest planning and management. The use of this hierarchy to guide RNA establishment will provide a stronger link between the RNA network, and planning and ecosystem management at multiple spatial scales. RNAs can be useful to land management planning by serving as high-quality relatively intact reference ecosystems for monitoring the effects of different management on the same ecological unit.

Subsections

The ecological unit used in the framework as the basis for RNA representation is the **subsection** (Table I). Subsections correspond to major landforms of tens to thousands of square miles that have similar surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities (ECOMAP 1993). Brief subsection descriptions and references across the eastern United States can be found in Keys *et al.* (1995). Detailed subsection descriptions for the Lake States can be found in Albert (1995).

The subsection level of the hierarchy was selected because subsection is the lowest level of the hierarchy for which all national forests have completed classification and mapping. A subsection-level map was completed across the entire eastern United States in 1995 (Keys *et al.* 1995). Individual national forests which have completed mapping below this level may choose to represent the full complement of Landtype Associations (LTAs) or Ecological Landtypes (ELTs) in each subsection (Table I). Selection of individual land units in LTAs or ELTs can still be based on the location of natural communities in these units.

The goal is not to protect a certain acreage within each Subsection, but to provide one or more RNA(s) that exemplify landscape patterns, common and rare elements, natural disturbance regimes, when possible, and other components related to the biological function of the ecosystems that occur within the Subsection.

When a Subsection occurs on two (or more) national forests, forests can work jointly to provide for ecosystem representation within RNAs. An RNA on one national forest may provide the baseline area for that same Subsection on another national forest.

When Subsection boundaries extend beyond the national forest boundaries, this provides an opportunity for the Forest to cooperate with agencies and organizations interested in conserving biological diversity and providing representation of ecosystems in reserves. Areas equivalent to RNAs in protection status (RNA-equivalents) include State Natural Areas and TNC preserves. Other areas may qualify as "RNA-equivalents" if they are equivalent in protection status (*e.g.*, secured from recreational conflicts, timber sales, and salvage logging after blowdown; see criteria for what constitutes "protected").

National Vegetation Classification

The Nature Conservancy's U.S. National Vegetation Classification (USNVC) is used in addition to the National Hierarchy to provide information on the current biological diversity within National Hierarchy ecological units. The Nature Conservancy's U.S. National Vegetation Classification (USNVC) classifies terrestrial natural communities based on plant community characteristics (Table II). It describes existing (rather than potential) vegetation of both forested and non-forested types. The classification is integrated with state Natural Heritage Program databases, permitting range-wide assessments of high-quality natural community occurrences. This classification has been adopted as the vegetation classification standard by the Federal Geographic Data Committee (1997).

Alliances

In the Regional RNA framework, within subsections, the community level for representation is the **alliance** (Table II, Appendix IV). Alliances are distinguished using dominant or diagnostic species of the dominant or uppermost layer of the vegetation (Faber-Langendoen *et al.* 1996, Sneddon *et al.* 1996, Drake and Faber-Langendoen 1997, Grossman *et al.* 1998). Alliances are similar to SAF cover types in that they both are based primarily on species of the dominant strata or canopy. However alliances are often somewhat more finely delimited than SAF types (that is, one SAF type can include more than one alliance) because alliances consider more comprehensive floristic information and environmental patterns. And unlike SAF types, alliances describe non-forested types in addition to forested types.

Because ecological units have not yet been mapped or are unmappable to finer levels on all national forests, and because the subsection is a fairly broad ecological unit, the natural community classification is a useful addition that helps describe and represent the biological variability within the subsection. Existing natural communities also provide a good measure of the current quality of the biological aspects of an ecological land unit, which changes through time due to management practices and ecological processes

A community component to RNA representation is important for several reasons:

(a) A network of RNAs that represents ecological units at the level of subsection but does not represent communities may fall short of representation of **all natural communities** found in that subsection.

(b) The community classification system is based on current vegetation, and current vegetation can be **evaluated for quality**. Natural communities can be ranked using heritage protocols to select the best quality examples of these community types to protect and maintain in RNA status.

(c) Including a community classification component makes it possible to show correspondences among **(crosswalking)** the community types (alliances) and **SAF cover types** being represented in RNAs.

(d) Using TNC's national community classification system allows description of natural communities **beyond national forest or state boundaries**. Thus Forests in different states that share Subsections can work to represent communities while making sure they are communicating about the same community types.

Some alliances may be grouped together to combine similar alliances. Some alliances that occur together spatially may also be combined for the purposes of checking community representation. In some ecological provinces, alliances could be crosswalked to Landtypes or Landtype Phases to evaluate community representation by these units.

Community pattern is an important attribute of an alliance for the purposes of this RNA assessment. Community pattern describes the landscape pattern that is (or was) typical of an alliance across its entire range. It categorizes the degree to which an alliance forms (or formed) extensive cover on the landscape (Table III). An alliance is assigned to one of 3 classes: **matrix, large patch**, or **small patch**.

> ***Matrix alliances*** form extensive and often unfragmented cover, such as a spruce - fir forest or a maple - basswood forest. They are often influenced by large-scale processes (*e.g.*, climate, fire), and are important habitat for wide-ranging or large area-dependent animals, such as large herbivores, carnivores, or birds.
>
> ***Large patch alliances*** form large areas of cover, such as a tamarack swamp or a paper birch forest. Like matrix alliances, large patch alliances are influenced by large-scale processes, but these tend to be modified by site-specific features.
>
> ***Small patch alliances*** form small, discrete areas of cover, such as a non-tidal mud flat or a dogwood - willow swamp. They are characterized by localized, small-scale ecological processes that can be quite different from the large-scale processes operating in the overall landscape. The specialized conditions of small patch alliances, however, are often dependent on the maintenance of ecological processes in the surrounding matrix and large patch communities.

Community pattern is considered when ranking the **quality/viability** (see page) of alliance occurrences (matrix alliances require larger areas of protection) and for prioritizing representation needs (matrix alliances are considered a higher priority). In this assessment, all lists of alliances are sorted by community pattern.

Plant associations are a floristic level below the alliance, and rely on total floristic composition to distinguish community types, rather than just species in the dominant or uppermost vegetation layer. For example, in the jack pine forest alliance, drier stands with an understory of feathermoss are separated from moister stands with balsam fir and other tall shrubs into different associations. TNC has completed a national list of associations for the United States (Anderson *et al.* 1998) and TNC and state Natural Heritage programs are working to track information at this level.

Although the alliance is the natural community level used in this RNA assessment, much of the information was collected at the association level and is available upon request from the authors. (For alliances and associations occurring in the Forest Service Eastern Region, 46% of alliances contain only one association, and the range is 1-17 associations per alliance, with an average of 2.6.)

Aquatic representation

Aquatic ecosystems are important to represent within the national RNA network. Until the Regional RNA Framework for aquatic ecosystems is developed, several resources can be used to guide the representation of aquatic resources in RNAs. The representational framework is likely to have a component based on aquatic ecological units and on the aquatic communities found within these units.

The aquatic counterpart to the National Hierarchy of Ecological Units has been published as A Hierarchical Framework of Aquatic Ecological Units in North America (Maxwell *et al.* 1995) (see Appendix V). The aquatic ecological units for surface-water and ground-water systems have been described in relation to their geoclimate setting; the level of subbasin (surface water systems) corresponds to the land ecological unit of subsection (see Appendix V). The Nature Conservancy is

developing an approach for classifying aquatic ecosystems and aquatic communities (Lammert et al. 1997; Higgins *et al.* 1999, see Appendix VIA for excerpts). Ecological groups, as defined by Higgins *et al.* 1999) for TNC (see Appendix VIA), roughly correspond to the levels of River Basin and Section in the Maxwell *et al.* (1995) classification (see Appendix V). Macrohabits (as defined in Higgins *et al.* (1999)) comprise valley segments and lakes (Maxwell *et al.* (1995). Aquatic macrohabitats have been classified for the Great Lakes Ecoregion (Higgins *et al.* 1998; see Appendix VIB).

For aquatic communities, The Nature Conservancy is developing a national classification. Aquatic alliances correspond spatially to macrohabitats. When completed, the national classification of aquatic communities could be used along with the Aquatic Ecological Unit Hierarchy (*e.g.*, subbasins, Maxwell *et al.* (1995)) and The Nature Conservancy's aquatic framework (*e.g.*, ecological group, Higgins *et al.* 1998, 1999) to develop a suitable framework for representation of aquatic systems in the network of RNAs. Until then, available hierarchical classifications for aquatic units (*e.g.*, Appendices V, VIB), and aquatic community classifications (*e.g.*, those used by State Heritage Programs; see Appendix VII) can be considered by national forests when planning for or evaluating representation of aquatic systems in RNAs.

V.C. How much is enough?

When planning for reserves or "set asides", often the question is asked, how much is enough? There are two components to this question:

- How big does a reserve need to be? (emphasis on ecosystem patterns, processes, and viability; design of one reserve)
- How many reserves do we need? (emphasis on replication; design of reserve network)

Representation

One way to address the question of "how much?" is to consider representation in light of the objectives of RNAs. As one of the purposes of a representative RNA network is to provide baseline or reference areas for comparison to manipulated ecosystems for monitoring and research, then it follows that an alliance within a subsection (alliance-subsection combination) would be *represented* if there is at least one example (occurrence) of the natural community (alliance) in the subsection that can fulfill this purpose (to serve as a baseline or reference area). To fulfill this purpose, enough area needs to be protected to provide for the composition (native species in combinations that are within the range of natural variation), structure (community organization and interactions among species), and function (natural processes, sometimes at a landscape level; maintenance of spatial and temporal patterns) of the ecosystem.

Thus, the Regional RNA Framework addresses the "how much" question from the perspective of being able to provide ecologically intact reference areas, rather than recommending the protection of a specific *acreage* of an alliance-subsection combination, or protection of a certain *percentage* of the existing acreage of a given community type. (For rare ecosystems, a high percentage (even 100%) might be recommended for protection; for a common, widespread ecosystem, a small percentage of the total acreage of the community type would likely be adequate.) The recommended criteria for representation are described in the next section.

Replication

Planning for ecosystem representation may call for a look at whether replicate examples should be included in a network of natural areas. What will happen if the one ecosystem example is destroyed by a

catatrophic disturbance (blowdown, fire, hurricane, flood)? Will there be another example of the alliance-subsection combination on hand? How important is it to have replicate examples for some or all ecosystems? Additional discussion of replication can be found in "Guidelines for representing ecological communities in ecoregional conservation plans" (Anderson et al. 1999).

Using the Regional RNA Framework, by representing alliances at the *subsection* level, replication of alliances is achieved at the *section* level. If a protected example is identified for each alliance within a subsection, then an alliance that occurs in several subsections (within the same section) will be replicated within the section.

National forests may choose to replicate certain alliances or ecological units, based on local or regional needs and to provide for representation at appropriate spatial and temporal scales.

V.D. Criteria for representation

What kinds of criteria help evaluate sites for *representation* of the ecosystems present? How do we judge if a natural community (that is, an alliance) in a subsection can adequately serve the purpose of baseline ecosystem and is indeed *represented*?

Two components are recognized here that determine representation for the purposes of the RNA Assessment:

- Adequate protection
- Adequate **quality/viability**

Adequate protection

Protection criteria for Forest Service RNAs are given in the Forest Service Manual 4063 (see Appendix I). Management standards and guidelines for RNAs typically include:

- allow (by permit) non-manipulative research activities; allow restricted collecting on case by case basis
- allow management activities that promote natural processes or restore ecosystems consistent with RNA objectives
- allow hunting, fishing, hiking, berry picking and other dispersed recreation, subject to limits or restrictions based on site characteristics and RNA objectives
- limit or prohibit certain recreational uses, if needed based on sensitivity of site and RNA objectives
- limit trails and associated structures to those consistent with site protection and educational use
- do not allow recreational improvements such as developed campsites, picnic areas, ski areas
- do not allow access to horses, ATVs, mountain bikes
- exclude roads from the RNA, or close roads within RNA

A high level of protection like that of an RNA is called "Level I" by Caicco *et al.* (1995); the concept is also used by The Nature Conservancy for conservation planning.

Level I ("Highly Protected Managed Area")

An area "maintained in its natural state with an active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference."

RNAs are not unique in having a high level of biodiversity protection. The protection status of some other federal, state, tribal, and private natural areas is similar to that of RNAs. The Regional RNA

Framework recognizes that, if adequately protected, both Forest Service and non-Forest Service protected areas in subsections of national forests may serve as **RNA-equivalents** (Tyrrell 1996) by addressing representation of alliances in subsections.

To be "accepted" as an RNA-equivalent, an area must have protection at least equal to that of an RNA. In this assessment, we use Level I status as the protection criterion for RNA-equivalency.

Typical Level I areas (that are therefore RNA-equivalents) include preserves of The Nature Conservancy and State Natural Areas. Some zones or portions of additional non-Forest Service areas **may** be RNA-equivalent if they meet or exceed the RNA protection criteria as given in the Forest Service Manual (USDA Forest Service 1994) and are equivalent to the TNC Level I Protection status:

- National Park Service units
- State or county parks
- State or county forests
- Tribal natural areas

It is also an option for the land management agency or organization to designate such an area as a non-Forest Service RNA.

On lands managed by the Forest Service, some areas with other designations (or parts of areas) *may* be RNA-equivalent, or considered for co-designation as RNAs, if management objectives are consistent with RNA management standards and guidelines. The following designations might include RNA-equivalent areas:

- Wilderness
- National Recreation Areas
- Wild and Scenic Rivers
- Primitive Non-motorized Areas
- Botanical Areas
- Special Interest Areas
- Special Areas

In Congressional designations such as Wilderness, National Recreation Areas, or Wild and Scenic Rivers, there may be zones within the designation where management restrictions are in place, or could be allowed, to protect special features. These zones may be suitable for co-designation as RNAs. It should be kept in mind that the management prescription for any Congressional designation will always take precedence over standards and guidelines for the RNA. Sites elsewhere that represent higher quality alliance-subsection combinations should be given full consideration for RNA designation, rather than assuming that co-designation is preferred.

Candidate RNAs (cRNAs) are managed as RNAs, but until they are established, they do not have "permanent" Level I protection. Therefore they are not considered RNAs or RNA-equivalents and are not included in this assessment.

Adequate quality/viability

In addition to having adequate protection (see previous section), to be sure an occurrence can serve as a baseline area, an occurrence of an alliance in a subsection must have attributes that we collectively refer to in this RNA Assessment as **quality/viability**. The two terms "quality" and "viability" are used together because neither term alone fully explains the meaning of the rank. "Quality" could be mistaken for the *condition* component of the rank, and viability, a term generally used for individual species, has a different meaning for communities. For a species, population, or individual, *viability* indicates the

capability of surviving into the future. We must qualify what we mean by the "extinction" or "elimination" of a community. The definition of a community type allows for variation in species composition and ecological process, but beyond a certain point of degradation, where many of the native species and the processes have been eliminated, an occurrence can no longer be identified as fitting into that type. If a community has symptoms of reaching this state, we consider it *unviable*.

The term quality/viability has been applied to occurrences of natural communities by The Nature Conservancy and the network of Natural Heritage Programs. Recently, a revised standardized method has been proposed for ranking (from A to D) the quality/viability of occurrences of natural communities (The Nature Conservancy 1997). Here, for the RNA Assessment, we have modified this method to rank the quality/viability of occurrences of alliances. (See the Methods section and Appendix VIII for a more complete description of our ranking method).

The ranking scale, ranging from A to D (Table IV), incorporates criteria based on:

- size (which depends on the *community pattern* of the alliance),
- stand condition (species composition, structure, ecological processes, "naturalness"), and
- landscape context (influences of surrounding landscape).

Using this method, a natural community (alliance) in a subsection is represented when at least one A- or B-ranked (high-quality) example occurs on an RNA or RNA-equivalent. Alliances with only a C-ranked occurrence on an RNA or RNA-equivalent in a subsection are not considered represented; however, they may be a lower priority for future representation than alliances that do not occur on any RNAs or RNA-equivalents in the subsection.

We encourage the RNA committee of each national forest or groups of national forests to further consider the question of "what is representation?" and to evaluate whether each example of an alliance in a subsection provides sufficient representation for that alliance in the subsection (and thereby to evaluate the quality/viability ranking method as well).

V.E. RNAs and the role of partnerships

Partnerships play a key role in the Research Natural Area program, and are an important aspect of the Eastern Region RNA Framework. National Forests and Research co-administer the Research Natural Areas Program. The RNA Program is further strengthened by partnerships with other Forest Service programs, other federal agencies, state agencies, and non-governmental organizations. These partners provide support of expertise and experience to the RNA Program, and the protected areas that result from the partners' protection efforts can become part of the RNA network. In return, the RNA network can fulfill some of these partners' conservation goals. Emphasis will be placed on selecting the best representative areas. An attempt will be made to enter into agreements with other Federal, State, and County agencies or other organizations that manage lands to identify and designate representative sites.

Cooperation and RNA-equivalents

The concept of RNA-equivalents allows the RNA Program to share the responsibility of providing reference areas in a subsection with other state or regional conservation planning groups. For example, the Hoosier National Forest can rely on the 31 Indiana State Nature Preserves (covering more than 3,000 acres) in the four Subsections on the Forest to fill some of its representation needs. The Mark Twain, which currently has no established RNAs, can rely on 18 Missouri State Natural Areas located on national forest land and additional areas off national forest land to fill some of its representation needs (Tyrrell 1996).

Forest Service personnel together with conservation partners can determine what types of areas are RNA-equivalents using the RNA standards for management in the Forest Service Manual (USDA Forest Service 1994), the Level I protection criterion (Caicco *et al.* (1995), or other criteria on which they agree.

Shared ecological units

When a subsection occurs on two or more national forests, it is particularly important for these forests to coordinate work in these subsections. Detailed information is given for the national forests that share ecological units at the subsection level (Chequamegon-Nicolet, Ottawa, and Hiawatha). National forests within the same Province (Appendix IX) may also benefit from coordination of representational work. Although National Forests and Grasslands outside the Eastern Region may not apply the same framework, coordination across this political boundary is encouraged. The national forests and grasslands that occur within the same Province as an Eastern Region national forest are included in Appendix IX. Subsections occurring on the Mark Twain also occur on the Ozark National Forest (Southern Region), subsections found on the Monongahela also occur on the George Washington and Jefferson National Forests (also Southern Region). Information for the Mark Twain and Monongahela explains this overlap further. National forests together build the national network of representative RNAs.

VI. RNA ASSESSMENT

The primary goal of the assessment is to provide information about gaps in RNA representation of ecosystems on national forest lands in the Eastern Region. We gathered the information based on the RNA Framework for the Eastern Region, namely, *the representation of the range of natural communities (alliances) occurring in ecological units at the subsection level.*

The information is presented for each national forest, but we encourage the RNA committees to coordinate planning for additional RNAs where two national forests are located in the same subsection. In addition, a review of information at province and regional levels by the regional RNA Committee will ensure that suitable priorities and emphases are given to representation of ecosystems based on province-wide and region-wide distribution.

VI.A. Key questions

The RNA assessment addresses the following questions for each national forest:

1. What are the ecosystems found on national forest lands?
    a. Which subsections occur on national forest land?
    b. Which alliances occur on national forest lands in these subsections?
2. Which alliances-subsection combinations are represented on existing RNAs and RNA-equivalents?
3. What is not represented?
4. How might gaps in representation be prioritized?

VI.B. Methods of the assessment

Methods used for the entire Eastern Region are described here. Methods specific to a national forest are described in the assessment information for that Forest (section IX).

Identifying subsections and natural communities (alliances) on national forest land

Subsections

To list the subsections occurring on each national forest, we overlaid a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo) on the digital Subsection map of Keys *et al.* (1995).

We estimated the percentage of each national forest in each subsection and the percentage of each subsection that was national forest land by overlaying digital national forest maps with the digital Subsection map of Keys *et al.* (1995). We used digital ownership boundaries provided by those national forests with such maps; otherwise we used proclamation and purchase unit boundaries provided by the national forest or the 1972 national cover of proclamation boundaries provided with ArcInfo. Although national forests may acquire more land within proclamation boundaries, RNAs are not likely to be established on inholdings anytime in the near future. Therefore in this assessment we focus on lands managed by the USFS, which we call "national forest land" or "national forest ownership."

We refer to the percent of a subsection managed by a national forest as the *prominence* of land coverage by the Forest in each subsection. Prominence is used in the RNA assessment to organize and prioritize subsections for RNA selection and establishment. We refer to the percent of national forest land in a subsection as the *dominance* of a subsection in the national forest. Dominance could also be used in setting priorities for RNA selection and establishment.

Distribution of alliances among subsections

We compiled, from a variety of sources, two kinds of information about the distribution of alliances:

1. all alliances that occur in each subsection with national forest land, and
2. of these alliances, those that occur on national forest land in the subsection.

The alliances which occur on Forest Service lands are the focus of the RNA assessment.

As a starting point, we requested natural community occurrence records from state Natural Heritage Program databases. In most state program databases, the National Vegetation Classification community name is stored in each community occurrence record. These names are usually association names, but they are easily converted to alliance names, as each association falls within only one alliance in the hierarchy (see Table 2). The subsection of each occurrence was either provided by Heritage Program staff or obtained by overlaying a point map of community occurrences (generated from latitude and longitude) on the digital Subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because state database information on community occurrences is incomplete, national forest and state Heritage ecologists were asked to contribute their knowledge of the distribution of associations and alliances across subsections, both on and off national forest land. Some Forest ecologists used the Forest Service timber databases (Combined Data System) to aid their work.

The information was compiled for each national forest in the form of a list, by subsection, of all the alliances found both on and off Forest Service land. For most national forests, these data were reviewed by State Heritage and national forest ecologists.

Identifying representation of subsections and natural communities (alliances) on RNAs and RNA-equivalents

RNAs and RNA-equivalents were listed by subsection for each national forest. We identified RNA-equivalents state-by-state. We began with Michigan, Minnesota, Missouri, and Wisconsin, where RNA-

equivalents were identified at a state meeting of national forest personnel and appropriate federal, state, and private partners. For the remaining states we identified RNA-equivalents using the guidelines established at the other states' meetings and consulted national Forest, state, and Nature Conservancy ecologists when needed. Typical RNA-equivalents include State Natural Areas, The Nature Conservancy preserves, and other private preserves. Other RNA-equivalents are located in National Park Service units and in some special designations of the Forest Service (such as some wilderness areas).

Our methods for determining the subsection of occurrence for each RNA and RNA-equivalent depended upon available information. They included consulting the RNA Coordinator, consulting state and private ecologists, and creating GIS overlays. See Appendix X for a list of established RNAs by subsection. (Candidate RNAs are not included in the assessment as there is no guarantee they will be established.)

Digitizing RNAs

All national forests provided USGS 7½-minute topographical maps with outlines of RNA boundaries. Some national forests had an existing digital cover of RNA boundaries, which was provided to us. For the other National Forests we digitized from the topographical maps. Candidate RNAs were not digitized unless they were close to being established.

A digital map of RNA boundaries for the entire Eastern Region, a subregion (Lake States, Central States, Eastern States), or an individual national forest is available from the Regional RNA Coordinator. Based on scale and accuracy, the maps are appropriate for location, shape, and overlays at the scale of a national forest or state; they are not appropriate for determining RNA area, RNA perimeter, or precise boundary locations.

Identifying the presence of alliances on RNAs or RNA-equivalents

For each RNA and RNA-equivalent, we determined

1. the subsection(s) in which it occurs; and
2. the alliances (and, if possible, associations) present, with their approximate acreage and condition.

All RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. In older Establishment Records, only the SAF types of most interest to RNA establishment are described; more recent Establishment Records have a more complete description of RNA vegetation and include Heritage community types or other vegetation classifications which are more closely related to alliances. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

The sources of community information on RNA-equivalents are very different for each state and RNA-equivalent type. The accuracy and completeness of this information is also highly variable. Element Occurrences (EO) provided good information, but they have been identified only on portions of a minority of RNA-equivalents. For some states an ecologist provided us with a list of alliances—with acres—for each area, for others we assigned alliances based on vegetation descriptions found in paper files, and for some states there was no additional information. The National Vegetation Classification is relatively new, and information had not always been collected that would allow us to assign stands to the association or alliance level.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not provide representation. Instead it is listed with a question mark in the second Appendix for each national forest. Any reader with knowledge of the site who verifies or corrects an alliance assignment should

notify the RNA Coordinator of the appropriate national forest; answered questions may result in additional ecosystems represented.

Ranking the quality/viability of alliances on each RNA or RNA-equivalent

As mentioned above under "Criteria for Representation", TNC and the Natural Heritage Programs will soon use a standardized method for ranking the quality/viability of occurrences. We used this method to rank the quality/viability of occurrences of alliances on RNA and RNA-equivalents (see Appendix IV). The core concept of the method is to rank three factors—size, condition, and landscape context—separately, and combine the three ranks into one overall rank. The ranks range from A (excellent) to D (poor).

State Heritage program ecologists have not visited each RNA or RNA-equivalent to evaluate the natural communities that are present, and we did not visit the sites. Instead, we estimated the rank for each occurrence by adding some modifications to the basic method:

- In most RNAs and RNA-equivalents, we assigned ranks at the association level and later converted the associations to alliances. In the rare case that two or more associations on an RNA or RNA-equivalent are in the same alliance, we assigned to the alliance the highest of the association ranks.
- **Size:** We assigned the size rank based on the total acreage of the alliance on the RNA or RNA-equivalent. Three acreage scales were used to rank occurrence size, one for each level of community pattern: matrix alliance, large patch alliance, and small patch alliance (Table III, Appendix VII, X). Alliance occurrences for which we had no acreage information were given a size rank of U (unknown), and the overall rank was assigned assuming the size rank had the lowest possible score.
- **Condition:** For occurrences that are Heritage Element Occurrences, condition ranks came from the EORank field in the Heritage database. Other occurrences—unless we had additional information—were assigned an AB rank (excellent/good).
- **Landscape context:** Occurrences on a wilderness area or on an RNA or RNA-equivalent exceeding 5,000 acres were given an A rank (highly connected landscape). Currently no Eastern Region RNAs are larger than 5,000 acres. Occurrences on smaller RNAs were given a B rank (moderately connected landscape) based on their location on national forest land. Occurrences on smaller RNA-equivalents on National or State Forests were also given a B rank. Otherwise the landscape was ranked BC or lower (moderately to highly fragmented). It was difficult to determine with certainty the landscape context of occurrences.

Several **assumptions** were used in this method:

1. The total acreage of an alliance on an RNA or RNA-equivalent, as reflected in the *size* rank, is one occurrence; *i.e.*, the alliance occurs in a relatively contiguous patch on the RNA or RNA-equivalent. This is true even if the alliance consists of more than one association on the RNA or RNA-equivalent.
2. The rank of an alliance occurrence is equivalent to the highest of its component association ranks.
3. The requirements for the establishment of RNAs and RNA-equivalents are rigorous enough that occurrences are in excellent to good *condition*.
4. The *landscape context* of a occurrence in a wilderness area or on a very large (greater than 5,000 acres) RNA or RNA-equivalent is excellent. The landscape context of an occurrence on National and State Forest land is good. The landscape context of an occurrence *not* on National or State Forest land is fair to good.

The validity of these assumptions is discussed in the "Completeness and accuracy of data in the assessment" section.

The quality/viability ranks are preliminary and need further field verification. If Forest Service personnel re-rank these occurrences or rank new occurrences, the procedure described in Appendix IV should be used. They should not need to use the assumptions above if more information about the site and occurrence is obtained.

An alliance is considered represented on an RNA or RNA-equivalent if its overall rank is A, B, or AB. BC- or C-ranked occurrences are considered inadequate for representation at this time, but they are worth noting if priorities need to be set. D-ranked occurrences were excluded from this assessment.

Identifying gaps in representation

We used a matrix of columns of subsections by rows of alliances to visually summarize alliance-subsection combinations that are unrepresented by RNA or RNA-equivalents. In each national forest report, this is displayed as Table 5. A sample table appears below. All alliances that occur on National forest lands are listed in the first column and grouped by community pattern (Table III). The column headings are subsections, listed from left to right in descending order of national forest prominence in the subsections. This arrangement of the matrix allows all unrepresented ecosystems (gaps) and possible priorities based on community pattern and prominence to be seen in the same table (*i.e.*, the upper left part of the matrix is considered higher priority than the lower right because these are the more prominent subsections in the national forest with matrix-scale alliances.).

	Subsection			
Alliance	SubsectionA	SubsectionB	SubsectionC	SubsectionD
Alliance1	1 1 (2)			
Alliance2	(1) (2)	2		2 (5)
Alliance3	(1)			

To be included in the matrix, each subsection and each alliance occurs somewhere on national forest land. However, not all alliances occur on national forest land in each subsection. If an alliance occurs on national forest land in a subsection, the cell for that alliance and subsection is shaded. The shaded cells are the cells that need representation. If an alliance does not occur on national forest land in a particular subsection (*i.e.,* the cell is not shaded), then it does not need representation in that subsection.

Alliances reported to *possibly* occur on national forest land in a subsection are shown in the matrix by a partially shaded cell. This information is provided to allow for the review of data, but for the purposes of the needs assessment these alliances were considered *not* to occur in the subsection.

Gaps in representation are shaded cells that do not have numbers in the left side of the cell. The numbers in the left side of the cell are the number of A- or B-ranked occurrences on RNAs (top) and RNA-equivalents (bottom, with parentheses). The numbers in the right side of each cell are the number of C-

ranked occurrences on RNAs (top) and RNA-equivalents (bottom). If a cell has *only* C-ranked occurrences, it still considered unrepresented, but it may be a lower priority to represent than cells without numbers.

For example, in the sample table, Alliance2 and Alliance3 need representation in SubsectionB. All other subsections and their alliances are represented. Alliance1 does not need representation in SubsectionC unless the possible occurrence of the alliance on national forest land in SubsectionC is verified. In SubsectionB, Alliance2 might be a lower priority to represent than Alliance3, because there are 2 low-quality occurrences of Alliance2 on RNAs.

The table also shows the presence of an alliance in a subsection regardless of its presence on national forest land. The relationship is symbolized by a dot in the center of the cell. An unshaded cell with a solid dot means the alliance occurs in the subsection but not on national forest land. If the dot is hollow, the alliance was reported to *possibly* occur in the subsection. Unshaded cells with dots have numbers in them if the alliance is protected by one or more RNA-equivalents. The purpose of this additional information is to provide a broader perspective to the work of each Forest, and to aid partners of the Forest Service in their conservation planning.

For example, in the sample table, Alliance1 occurs on national forest land in SubsectionA, does not occur in SubsectionB, occurs in SubsectionC, *possibly occurs* on national forest land, and *possibly* occurs in SubsectionD, but does not occur on national forest land.

VI.C. Sources of information for the assessment

We did not do field work to collect the data for the assessment. Rather, we relied on the following sources for our data. Additional sources can be found in the "References" section.

Databases

- Data provided with Digital Subsection map of Keys *et al.* (1995): Subsection information (Geomorphology, Elevation, Area, Presettlement Vegetation, Natural Disturbance)
- Natural Heritage Program databases
- Forest Service Combined Data System (CDS)

Geographic Information System (GIS) Coverages

- Digital national forest boundary maps (proclamation and ownership)
- Digital Subsection map of Keys *et al.* (1995)
- Digital presettlement vegetation maps (Michigan (Comer *et al.* 1995), Minnesota (Marschner 1974), Wisconsin (Finley 1976)

People (see Acknowledgments for individuals)

- Forest Service ecologists, soil scientists, RNA Coordinators, and other specialists
- Land resource managers (*e.g.*, State Department of Natural Resources)
- Natural Heritage Program ecologists
- TNC Field Office Science and Stewardship Staff

Hierarchies

- National Hierarchy of Ecological Units (ECOMAP 1993)
- National Vegetation Classification (Grossman *et al.* 1998)

VI.D. Completeness and accuracy of data in the assessment

Subsection delineation

The scale of the subsection map (Keys *et. Al* 1995) is large (1:3,500,000, which means 1 cm on the map = 35 km on the ground). Points that occur close to a subsection boundary may appear to fall in the wrong subsection. For some borderline RNAs and RNA-equivalents, a Forest Service or partner organization employee was able to tell us the correct subsection based on their knowledge of the subsection delineations. Undoubtedly there are a few cases in which the subsection listed for an RNA, RNA-equivalent, or Element Occurrences is in error. Some errors could mean that an RNA-equivalent is inappropriately included in or excluded from the Assessment.

Continual revisions are being made to subsection boundaries as more field work is completed. Some subsection boundaries used for this assessment have already been revised. Some adjustments to the assessment information will be needed to address these boundary changes.

Subsections have been mapped in the eastern United States but not in Canada (Keys *et al.* 1995). Therefore, subsections bordering Canada are artificially truncated at the U.S.-Canadian border, and the size of these subsections is underrepresented.

Alliances in subsections and on national forest land

The list of alliances for each subsection is likely to be incomplete, as is the presence of alliances on national forest land in each subsection. Element Occurrences have not been systematically recorded in any areas of the United States, and often do not provide information about presence on national forest land. The information in Forest Service Combined Data System (CDS) is of limited use for most national forests because most cover types can be multiple alliances. Our most complete information came from the knowledge of state and national forest ecologists.

Gaps in alliance information are discussed in more detail in each national forest report. Community information for national forests in eastern states is especially poor, and we consider these assessments to be preliminary.

Aquatic communities

This RNA assessment does not address aquatic representation. Lack of information on aquatic communities is a major limitation in this assessment. National forests will need to attempt to include these communities when making RNA selection decisions, without the benefit of a national classification or regional assessment.

At this time, the Regional RNA Framework is developed for only terrestrial and palustrine communities, in part, because a national classification for aquatic communities has not been completed by The Nature Conservancy. TNC staff are currently working to produced such an aquatic classification. Therefore, at this point, aquatic community classifications developed for ecoregions or for states can be used along with classifications for ecological units when planning for representation of aquatic systems (see Appendices V, VI, and VII).

RNAs and RNA-equivalents

Available information has been included for RNAs established as of January 1999 are included in this report. However, several candidate RNAs are in the final stages of establishment; information for these cRNAs will need to be added once they are established (e.g., Buffalo Beats, Wayne National Forest). Lists of state natural areas (SNAs) are complete based on information provided to us by Natural Heritage

Programs. However, the lists may lack those SNAs that were reported to fall outside a national forest subsection when in fact they occur in the subsection (see Subsection Delineation above). Lists of The Nature Conservancy Preserves are probably complete. Information about other types of RNA-equivalents was difficult to find, and there are designations that have not been evaluated for RNA-equivalency. Therefore the total list of RNA-equivalents may be incomplete.

Alliance occurrences on RNAs and RNA-equivalents

The accuracy of our listing of alliances on RNAs and RNA-equivalents is limited by several factors:

- At the time of this study, The U.S. National Vegetation Classification (USNVC) was relatively new, and most ecologists with vegetation information for RNAs or RNA-equivalents were still learning to use this classification.
- Information was provided to us in a variety of vegetation classifications, all of which differ to some extent from the USNVC.
- The information we received was often incomplete, at least in terms of being able to confidently assign USNVC alliances to vegetation descriptions.
- We were unable to visit the sites ourselves.

The alliance assigned to some occurrences is explicitly identified as uncertain in the assessment (and the occurrence is considered to not represent the alliance) but there is some uncertainty even for the occurrences which are not indicated as questions.

Ranking alliance occurrences

The overall ranks for alliance occurrences on RNAs and RNA-equivalents are estimates. (See "Ranking the quality/viability of alliances on each RNA or RNA-equivalent".)

Size ranks are assigned with confidence because they are based on a (usually) good estimate of acres assigned to the alliance. However, we know that our assumption that this acreage estimate represents one occurrence of the alliance is not always valid.

Condition ranks for all occurrences were assumed to be excellent to good (AB) based on the rigorous requirements for the establishment of RNAs and RNA-equivalents. However, we know that many RNAs and RNA-equivalents are established for one or two high-quality communities, and other communities that are included within the boundary may be low-quality buffer areas. In most cases we did not have enough information about the area to discern these low-quality communities.

Landscape context ranks were especially difficult to assign. The landscape context of occurrences on national forest land was assumed to be good (B) because the surrounding national forest land is relatively unlikely to disrupt natural processes or prevent animal or plant migration. However, some occurrences could be close to highly developed land in or out of national forest boundaries. Other landscape context ranks were based on assumptions of unknown validity.

Occurrences with too little information were assigned an overall rank of "U" (unknown). We did not count these occurrences as representing alliances. It is possible that with additional information some of these U-ranked occurrences would be assigned an overall rank of A or B and thus provide represention.

VI.E. Products of the assessment

Products of the assessment for each national forest are:

1. a) a list of subsections on national forest land,
   b) a list of alliances on national forest land in each Subsection,
2. a matrix of alliances by subsection (ecosystems to represent) showing high- and low-quality occurrences of alliances on RNAs or RNA-equivalents in each subsection,
3. a summary of needs for RNA representation with suggestions for selecting new RNAs, and
4. computerized (GIS) maps of RNA boundaries.

Products of the assessment for the Eastern Region are:

1. a) a list of national forests by Province (Appendix VII),
   b) a list of RNAs (Appendix VIII) and RNA-equivalents by subsection,
2. a summary of numbers of alliance-subsection combinations already represented on each national forest,
3. computerized (GIS) maps of RNA boundaries for the Eastern Region, available for the whole region or for a subregion (Lakes States, Central States, Eastern States), and
4. a matrix of subsections by alliances for the entire Eastern Region (ECOMAP).

VI.F. Summary of Eastern Region RNA Assessment results

Figure I shows the total number of alliance-subsection combinations identified on each national forest, the portion that are already represented, and the current gaps in representation. National forests are shown in three groups:

- Lake States (Chequamegon-Nicolet, Chippewa, Hiawatha, Huron-Manistee, Ottawa, Superior),
- Central States (Hoosier, Mark Twain, Shawnee, Wayne), and
- Eastern States (Allegheny, Finger Lakes, Green Mountain, Monongahela, White Mountain).

The figure shows a considerably higher number of total ecosystems to represent on national forests of the Lake States. The difference is in part a real difference in ecosystem diversity on these Forests, and in part a reflection of more complete data. Alliance data for the Hoosier and Mark Twain National Forests are somewhat incomplete, and alliance data for the Eastern State National Forests are seriously incomplete. We consider the Eastern States National Forest assessments to be preliminary.

For national forests with good RNA-equivalent community data (Lake States and Central States), inclusion of RNA-equivalents in the "representative network" substantially increases the number of alliance-subsection combinations represented. The increase per national forest ranges from 1 – 53% of total number in Lake and Central States Forests. In some cases (Mark Twain and Wayne National Forests), the only representation comes from RNA-equivalents.

Using available information and the proposed framework of representation, the number of gaps in representation is large (44 – 100% of total identified alliance-subsection combinations). However, it should be kept in mind that the number of alliance-subsection combinations represented by RNAs shows the level of representation that was achieved before the new Regional RNA Framework. Furthermore, some gaps are likely the result of missing information rather than missing protection.

VII. POSSIBLE PRIORITY-SETTING APPROACHES TO FILLING GAPS IN RNA REPRESENTATION

The regional RNA assessment identifies the ecosystems to represent, as well as the gaps in representation, for representation of natural communities (alliances) in ecological units (subsection level of National Hierarchy) for each national forest. The combination of all currently protected ecosystems (the resulting network of RNAs and RNA-equivalents) provides relatively high-quality examples of ecosystems, both unique and common, as reference areas for monitoring and research and as sites for the protection of biological diversity and natural processes.

The RNA assessment report for each national forest presents gaps in representation, based on the premise of the Regional RNA Framework that the ecosystems to be represented are all alliances in a subsection that are found on national forest land. In some cases, the number of these cells currently unrepresented by RNAs or RNA-equivalents may seem daunting, but the following can be kept in mind:

1. National forest personnel can review the list of alliances in each subsection to evaluate whether it should be modified or condensed for either ecological or administrative reasons. Such modifications might include, but are not limited to:
   (a) eliminating some seral alliances (these may be well-represented within other protected area landscapes due to patterns of natural disturbance such that these alliances do not need to be represented),
   (b) combining alliances that are very similar and thus are difficult to assign to community associations observed in the field,
   (c) recognizing that some representation cannot be accomplished because these community types have been lost or degraded beyond restoration,
   (d) eliminating alliances in subsections that have limited national forest lands unless they are unique or rare, and
   (e) splitting an alliance into its component plant associations if two or several associations are present and important to represent as baselines.
2. National forest personnel can obtain missing information about currently protected areas to quickly reduce the number of gaps:
   (a) Candidate RNAs should be evaluated for unrepresented alliances, and the establishment process completed if they fill gaps.
   (b) There are unresolved questions about the presence of some alliances on some RNAs and RNA-equivalents, as we did not visit the RNAs or RNA-equivalents listed in this assessment. Questionable occurrences are shown with question marks in Appendix B; they do not appear in any other tables, and do not provide representation. Turning the question marks into verified occurrences could quickly reduce the number of alliance-subsection combinations in need of representation.
3. RNAs can provide representation of more than one alliance-subsection combination. When representing common ecosystems, RNAs should be large enough to include landscape patterns or landscape-level processes. Thus an RNA (or RNA-equivalent) would likely contain several alliances; *i.e.*, the number of RNAs needed to fill gaps in representation is much fewer than the number of alliance-subsection combinations (ecosystems to represent).
4. RNAs can meet other land allocation needs. It is critical that identification and evaluation of suitable areas for filling all these gaps be conducted in a comprehensive forest-wide look at land allocation and land management planning. Allocating land to RNAs may also meet the national forest's need for old-growth areas. RNAs may be located in Wilderness if objectives are shared.
5. Addressing representative RNAs can be a multi-stage process. Due to budget, personnel, or time constraints that limit a National Forest's ability to fill all gaps in representation right away, National

forests can adopt a long-range approach to filling gaps in representation by prioritizing the gaps and assigning a timeframe for completing different priorities. The following section describes some of the ways that the national forest could assign priorities to filling gaps in representation. The first two priority-setting options have been used to organize and present the information included in the RNA assessment reports (prominence of subsection and community pattern). This is not a comprehensive list, and national forests may have other approaches to planning for additional RNAs.

Prioritization can be considered at the level of subsections, alliances, and alliances within subsections. Some possible methods within each category are described below.

VII.A. Prioritizing subsections

Prominence of the national forest in subsections

We define prominence as the percent of a subsection managed by the USDA Forest Service. A high prominence value for a subsection indicates that the USDA Forest Service is probably the organization best able to protect land to serve as reference ecosystems in the subsection. We used prominence to organize and prioritize subsections in the national forest assessment documents (e.g., each national forest's Table 5).

Dominance of subsections on the national forest

Subsections may also be prioritized by the percent of national forest land in each subsection, which gives an indication of the dominance of a subsection in the national forest.

Current representation of biological variation

The number of alliances in a subsection is a measure of biological variation within the subsection, and the percent of these alliances that are represented is a measure of the level of representation of biological variation within the subsection. Because the framework has the goal of representing all biological variation within a subsection, the percent of alliances represented may be used to prioritize subsections. A subsection with a lower percentage of biological variation (alliances) currently represented can be considered a higher priority.

The percent of alliances currently represented in each subsection is shown in Table 7b and used to prioritize subsections in the Synthesis section.

VII.B. Prioritizing natural communities (alliances) within subsections

Unrepresented alliances within a subsection can be assigned priorities based on any or all the following attributes (listed here in no particular order). There may be additional ways to assign priorities. Importance can be given to attributes, depending on the local or subregional conditions and planning needs.

Community pattern of alliances

Community pattern categorizes the degree to which an alliance forms (or formed) extensive cover on the landscape (see "National Vegetation Classification" section and Table III):

- Matrix — extensive, often contiguous
- Large patch — large, interrupted
- Small patch — small, discrete

Because matrix alliances are dominant features of the ecological unit, matrix alliances can be considered a higher priority to represent than large and small patch alliances. Alliances occurring on the national forest are sorted into matrix, large patch, and small patch alliances in each national forest's Table 8.

Need for reference areas

One of the primary goals of the representative network is to provide reference or baseline areas for use in monitoring or research. By comparing the reference area to the same ecosystem under different management, the effects of the management treatment can be monitored and evaluated. Thus it may be a priority to have reference areas for those alliances which are intensively managed for timber harvest or other high-use activities (recreation) where questions about sustainability or long-term effects could be addressed by having a control.

Threats

If an unmodified example of an alliance in a subsection is among a few remaining unmodified examples of an unrepresented alliance, and if this occurrence is in immediate threat of modification or destruction, it is likely a high priority to represent.

Community distribution of alliances

Community distribution describes the geographic distribution of an alliance in relation to a Province. The 4 classes of community distribution are based on the distribution of the alliance within and outside of the Province. The classes are **endemic**, **limited**, **widespread**, and **peripheral** (Figure II).

Endemic alliances occur primarily or only in the Province.
Limited alliances are somewhat common in the Province and also occur in one to several other Provinces.
Widespread alliances are somewhat common in the Province and in many other Provinces.
Peripheral alliances are rare in the Province and are more common in other Provinces.

A given alliance can be assigned to different community distribution classes for different Provinces. For example, Red Pine Forest Alliance is endemic to Province 212 (Figure IIa) and peripheral to Province 222. For a list of alliances endemic to each Province, and alliances limited to each Province which are also matrix alliances, see Appendix XI.

Alliances endemic to the Province(s) in which a national forest occurs may be a high priority to represent in the subsections where these alliances occur, because there is little or no opportunity for representation outside the Province. Alliances peripheral to the Province may be less important for national forests in this Province to represent. For a list of endemic alliances for each national forest, see the national forest's Table 8.

Alliances with rare associations

Just as species are ranked from "endangered" to "stable", so are communities at the association level. The ranking is done at the global level (G1-G5) by The Nature Conservancy, and at the state level (S1-S5) by state Heritage programs. Alliances are not yet ranked, per se, but the associations that comprise an alliance are ranked. Information about rarity can be obtained from state Heritage programs (see also Grossman *et al.* 1998) and could be used to help prioritize RNA selection to include rare alliances.

Pre-settlement vegetation

Use of available pre-settlement vegetation data (e.g., Appendix XII) provides information about the relative abundance of communities within subsections in the past. Comparisons with current alliance distributions across subsections may help document by subsection which alliances are now underrepresented and need priority protection.

VII.C. Prioritizing of natural communities (alliances) Forest-wide

In this assessment, alliances were prioritized by community pattern *within* subsections (see Section VII.B). The RNA committee of each national forest may also want to prioritize RNA selection and establishment by looking at the representation of alliances on the national forest as a whole. If an alliance is not represented on *any* national forest subsection, it may be a higher priority to represent in *at least one* subsection than it is to represent another alliance in an *additional* subsection. For each national forest, the alliances that are unrepresented forest-wide are listed in the national forest's Appendix C.

The alliance prioritization methods described in Section VII.B. may also be used to prioritize alliances Forest-wide. In addition, alliances that occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented may be a lower priority to represent than those alliances that are not protected at all.

VIII. IDENTIFYING AND SELECTING SITES TO FILL GAPS IN REPRESENTATION

Identifying and selecting sites to fill gaps in representation can be accomplished in a number of ways. Some selection criteria are addressed by the Forest Service Manual 4063.2 (See Appendix I).

The RNA Assessment identifies gaps in representation of ecosystems, but it is not a cookbook approach to finding sites to fill gaps. Site identification and selection methods to be used by a national forest are best determined by reviewing:

- the kinds of databases available (aerial photos, GIS layers, county biological survey data, Heritage EO data, detailed rare plant and animal inventories),
- the stage of Ecological Classification System (ECS) mapping on the national forest,
- the ability to coordinate with other state or regional conservation efforts, and
- the time and resources available for selecting sites.

The following principles should be kept in mind:

- RNAs should be large enough to include the patterns and processes of the ecosystems they are designated to maintain.
- RNAs can include more than one alliance-subsection combination.
- RNAs could be distributed across the national forest in various ways (*e.g.*, one per landtype association) to try to exemplify the range of biological diversity present on the Forest.

It may also be helpful to:

- Re-evaluate sites that currently provide representation, but may not be the best quality natural areas available.
- Check whether in-progress protection of sites by non-Forest Service conservation groups would represent unrepresented ecosystems.
- Review what representation candidate RNAs (already identified) would provide.

VIII.A. Approaches to identifying and selecting sites

Searches for suitable sites can use some combination of office (review or use of paper files, data bases, aerial photography, GIS layers, expert opinion, and district personnel knowledge of sites) and field (inventory, ground truthing aerial photography, field checking to determine condition of sites) information.

As part of land management planning, the RNA Assessment could be used in at least two approaches to site selection:

Approach 1:

1. Conduct searches for high-quality sites or landscapes. Alternative ways to identify potential sites or landscapes include:
    a) identify high quality communities or species hotspots within a subsection or landtype association and build landscapes from these individual sites OR
    b) identify representative landscapes within landtype associations, using a combination of community evaluation, landscape features, and ability of sites to represent landtypes OR
    c) use a GIS approach to search the national forest land base for watersheds or other landscapes that have the best combination of certain characteristics (*e.g.*, low trail density, high representation of ecological landtypes, high occurrence of rare elements)
2. Use the Regional RNA Framework and the RNA Assessment to check which unrepresented alliances-subsection combinations (ecosystems) would be addressed by establishing one or more of these sites as RNAs.
3. Evaluate each site on the basis of many factors, including Forest priorities, which alliance-subsection combinations are present, the quality/viability of alliances, and other administrative concerns (see screening).
4. Address any additional representational needs not covered by the sites identified by the initial search.

Approach 2:

1. Using Regional RNA Framework and RNA Assessment, identify alliance-subsection combinations (ecosystems to represent) that do not have RNA or RNA-equivalent representation. As appropriate and when needed, consider which unrepresented ecosystems are a priority to represent on the national forest.
2. Conduct office and/or field search for potential RNA sites or landscapes that would specifically address representational needs (sites which contain unrepresented alliances located in the subsection where representation is needed).
3. Evaluate and screen individual sites for quality/viability of alliances and for administrative concerns (see screening).

Regardless of the approach used, these questions can guide planning for RNAs:

- What are the spatial relationships of the sites with their surroundings and with other sites?
- How can the landscapes be designed to represent multiple alliance-subsection combinations (ecosystems) and provide ecological functions into the future?
- What set of sites *collectively* provides the best representation of ecosystems and meets other resource needs?

VIII.B. Screening process for potential RNAs

Sites can be reviewed or screened individually as well as collectively to determine which site or set of sites would be proposed for RNA establishment.

The following steps may be used to screen sites.

1. Determine which screening factors will be used, and which ones should be given more weight (are more important to the national forest).

2. Recognize, if needed, how the results of screening may be different if different factors are emphasized.

3. Apply the screening factors in the priority order identified to determine which areas (or parts of areas) previously identified have the greatest merit for further consideration as RNAs during the forest plan revision process.

4. Identify any additional needs for representative RNAs not met by the areas identified and screened.

5. Integrate the screening process with the other "demands" on forest resources, by considering landscape-scale planning for short and long-term land management planning.

Sites can be screened on the basis of:

- Representation of Ecosystems
- Quality/Viability of Ecosystems
- Administrative Concerns

The following series of questions can guide screening or evaluating sites to select those to be considered further in land management planning. Some questions can only be addressed by examining an *individual site* and its landscape context (*e.g.*, site quality, presence of alliances on a site, ownership pattern, what kind of management is taking place nearby). Other questions are best addressed when *several sites are examined collectively* (*e.g.*, which suite of sites best represents all the matrix alliances in the subsection? which suite of sites minimizes the acreage of private land within the "boundaries" of the proposed areas?)

Representation of ecosystems

This part of the screening considers which alliance-subsection combinations are present at the site and if those combinations include those that are currently unrepresented in established RNAs and RNA-equivalents. The screening of the quality/viability of the alliance at the site helps determine if the occurrence of the alliance at this site would indeed *represent* that alliance.

General

1. Which gaps in ecosystem representation identified by RNA Assessment are the most important for the national forest to fill?

2. Are there opportunties for TNC or State Natural Areas Program to establish preserves that will represent some of the gaps in ecosystem representation instead of national forest?

3. Can additional information be obtained for any existing RNAs or RNA-equivalents to find apparent gaps that have actually already been filled?

Site by site

1. Does this site contain ecosystems (alliances-subsection combinations) that have been identified by the regional RNA Assessment as gaps in representation?

2. Does this site contain ecosystems (alliances) that lack baseline protected examples on the Forest, yet are especially needed because these ecosystems are intensively managed for timber, recreation, etc. within this LTA or Subsection?

3. Does this site provide the best available example of a typical landscape within this LTA? Why should this area be selected over any other—what is the justification? Likewise, does this site protect an example of a rare or unusual landscape or ecosystem? Is this the only example of this ecosystem available to protect?

4. If the site is very large, are there ways to reduce the acreage included in this site, while still representing ecosystems and maintaining their function for the long-term?

5. How large an area is needed to adequately represent the ecosystems found at this site?

6. How much does this site duplicate the representation of ecosystems found at another site if both sites are protected?

Collectively for multiple sites

Are as many plant communities (alliances) as possible represented across the subsection?

Are the matrix alliances represented within each subsection?

Are the endemic alliances represented within each subsection?

Is each landtype association (LTA) represented? Are the typical landscapes found in each LTA represented?

Are the alliances that are intensively managed represented?

Are any ecosystems (alliance-subsection combinations) found on more than one site? Are replicate examples desired for these ecosystems?

Which ecosystems are not included in these proposed sites and would remain unrepresented?

What information can be gained from an optimization approach to representation within RNA networks under different conditions or contraints (see Snyder *et al.* 1999)?

Quality/viability of alliances

General

How should representational needs be balanced with those of quality (e.g., high-quality site with fewer ecosystems represented versus site with some lower quality communities but more ecosystems represented and better landscape protection)?

Site by site

1. What quality/viability rank (A, B, C) do the alliances at this site have, based on size, condition, and landscape context (see Appendix VIII)?

2. How does this site compare to other sites on the basis of any other selection factors used by the Forest?

3. Is the site large enough to provide long-term persistence of the ecosystems present? Is the site large enough to incorporate natural disturbance regimes? What reduction in site size, if any, would still allow for long-term persistence?

4. How does this site rank on the basis of rare listed plants, animals, or communities?

5. Is the quality of the site compromised by current roads, trails, snowmobile, or ATV routes that transect this area?

6. Will the natural-area quality of this area be compromised soon based on scheduled timber sales or other planned projects?

7. How do the land ownership patterns affect the ability to secure or ensure the ecological integrity of this site?

8. Does the management of areas around this site maximize the ecological integrity of the site? Is the site adjacent to other protected areas?

9. Does the boundary proposed for the site keep intact multiple ecosystems that function together as a unit?

10. Are there any other known sites that have a high quality that have been overlooked?

Administrative concerns

Site by Site

What impacts do the following have at the site:

- ownership patterns
- future access to private lands (in-holdings)
- mining or gas and oil interests
- roads, trails, power lines, snowmobile routes, campgrounds, recreational or other development
- timber sale contracts in site or nearby
- current or proposed recreational use
- need for active management or restoration including fire, removal of exotics
- ease of administration of the site boundaries
- type of management practices in the vicinity
- local political pressures

VIII.C. Selection criteria

If multiple sites, which have been identified through inventories for consideration as RNAs and screened for representation, quality/viability, and administrative concerns, still need to be evaluated further for selecting a subset of sites, criteria such as those listed in Table VI can be applied. The goal is to evaluate or compare sites considering many factors, in order to select those sites that will provide the best long-term representation of ecosystems.

Sites need not be of national or regional significance to qualify for RNA status. RNAs that are not high quality sites now may improve their quality/viability rank over time. If no high-quality natural sites are available to protect, then lower quality sites (best available) with high restoration or resilience potential can be protected. Thus the characteristics listed in the first column of Table VI are preferred over the second column.

However, if the unrepresented alliance-subsection combination is found only on a site that is severely degraded, and the natural community has a low restoration potential, or restoration efforts are very cost ineffective, then a decision can be made on a case-by-case basis about omitting the alliance-subsection combination (ecosystem) from representation.

The criteria in Table VI are listed by

- General criteria
- Criteria by community type (forest, riparian, lacustrine)
- Spatial planning (adjacency, connectivity, size, shape considerations)

Administrative criteria (best options given the current ecological, administrative, political, social situation).

The list of criteria given in Table VI is not exhaustive.

VIII.D. Establishment of RNAs

Sites suitable for establishment as RNAs may be identified because the sites…

- are needed for the RNA network, in order to fill gaps in representation or to provide for rare or distinctive elements,
- pass the screening "tests" for representation, quality/viability, and administrative concerns, and
- withstand further screening with selection criteria.

The decision to establish an RNA is a forest planning action. RNA establishment can occur as part of revising the Land and Resources Management Plan or as separate Plan amendment. In either case, establishment will follow Forest Service direction regarding changes to forest plans (FSH1920), National Environmental Policy Act (NEPA) (FSH1909.15), and RNA establishment (Forest Service Manual 4063).

The Regional RNA Program has developed a generic Establishment Record and other materials to help prepare documents necessary to establishment a research natural area. These can be obtained from the Regional RNA Coordinator.

IX. ASSESSMENT INFORMATION BY NATIONAL FOREST

IX. A. Allegheny National Forest RNA Assessment

ALLEGHENY SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Allegheny National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Allegheny National Forest land. The Allegheny National Forest is contained within 1 subsection (Allegheny High Plateau 212Ga), and 32 alliances have been identified to occur on Allegheny National Forest lands. These are the ecosystems to represent for the Forest.

A critical review is needed of the table (matrix) listing the alliance in the subsection to verify which alliances occur on national forest land and which alliances (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Three of the 32 alliances (9%) found on Allegheny National Forest lands within Subsection 212Ga are represented by the one currently established RNA. **RNA-equivalents** have not yet been identified.

UNREPRESENTED ECOSYSTEMS

Based on information in this assessment, the Allegheny has 29 unrepresented alliances within Subsection 212Ga. Methods for filling these gaps include:

- evaluating other protected areas as possible RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), the **high-priority alliances** for the Allegheny National Forest are the 2 matrix alliances (out of the 5 on the Forest) that are not currently represented:

- Eastern White Pine - Eastern Hemlock Forest Alliance and
- Sugar Maple - White Ash - American Basswood Forest Alliance.

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IX.A.1. INTRODUCTION

The Allegheny National Forest is located in northwestern Pennsylvania (Allegheny Figure 1). Its proclamation boundaries and purchase unit boundaries contain 742,834 acres, with 513,162 acres (69%) of this land in FY1997 managed by the Allegheny National Forest. The Allegheny National Forest occurs entirely in Province 212 (Laurentian Mixed Forest Province). Overview Appendix IX lists the other national forests in the Province. The Allegheny can work with the other national forests in this province to evaluate province-wide representation and establish priorities for the province.

IX.A.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Allegheny.

IX.A.2.a. Subsections

We identified the subsections occurring on the Allegheny National Forest using the digital subsection map of Keys *et al.* (1995) produced at a scale of 1:3,500,000 and a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo). These digital maps revealed that the entire Allegheny National Forest is contained within a single subsection.

IX.A.2.b. Distribution of alliances among subsections

Mark Anderson of The Nature Conservancy provided us with a 1994 alliance-by-subsection list, based in part on review by state Heritage Program ecologists from across The Nature Conservancy's eastern region. This list was updated to incorporate more recent changes to the National Classification classification (Grossman *et al.* 1998). Barbara McGuinness of the Northeastern Station provided us with a crosswalk of forest types on the Allegheny to alliances, which we used to determine those alliances that occur on national forest land.

Further information on alliances and associations may be available from the Natural Heritage Program databases maintained by the Western Pennsylvania Conservancy. This information needs to be integrated into the list of alliances that have been generated for this assessment.

IX.A.2.c. Identifying RNA-equivalents

A discussion of what constitutes RNA-equivalents for the Allegheny National Forest has not taken place. However, based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents for this assessment (Allegheny Table 2):

- State Natural Areas[1] and
- The Nature Conservancy's (TNC's) preserves[2].

Individual RNA-equivalents with these designations still need to be identified through discussions with state, federal and private organizations that manage land in the subsection. Allegheny National Forest personnel can work with conservation partners to evaluate areas and additional designations as RNA-equivalents. Some designations to consider are shown in Allegheny Table 3.

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[1] Subsection 212Ga occurs in both Pennsylvania and New York, so RNA-equivalents in both states are relevant.

[2] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

IX.A.2.d. Digitizing RNAs

The Allegheny National Forest provided us with a digitized copy of the Tionesta RNA boundary. Readers can request from the Regional RNA Coordinator a cover of the Allegheny RNA (see Allegheny Figure 2) in the projection used by the Allegheny (UTM 17, NAD 27), or a Region-wide RNA cover at regional projections.

IX.A.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

The Tionesta RNA Establishment Record contains information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. In this case, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Allegheny Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Allegheny National Forest; answered questions may result in additional represented alliance-subsection combinations.

No RNA-equivalents have been identified for the Allegheny National Forest.

IX.A.3. PRELIMINARY RESULTS

This section summarizes what alliance-subsection combinations occur on the Allegheny National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.A.3.a. Subsections on national forest land

The Allegheny National Forest is contained within 1 subsection (Allegheny Figure 2):

- Allegheny High Plateau (212Ga).

IX.A.3.b. Natural communities (alliances) in the subsection

A total of 43 alliances are reported to occur in the subsection. Of these, 32 are known to be on national forest land (Allegheny Table 5, first column); the 12 alliances not reported to occur on national forest land are listed in Allegheny Appendix A.

Of the 32 alliances occurring on the Allegheny National Forest, 5 are **matrix** alliances (see Allegheny Table 5, first set of alliances), 6 are **large patch** (second set) and 21 are **small patch** (third set). (See "National Vegetation Classification" in Overview.) Allegheny Table 5 lists all the alliances.

IX.A.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation is provided by one established RNA, and no RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on the RNA is shown in the appropriate cells of Allegheny Table 5. Only high-quality

occurrences provide representation. D-ranked and unranked occurrences are not addressed; see Allegheny Appendix B for a complete list of alliances occurring on the RNA.

RNAs
The Allegheny National Forest has one established RNA (Allegheny Table 1, Allegheny Figure 2):

- Tionesta Research Natural Area (2113 acres)

The RNA represents 0.4% of the total national forest acreage and <0.01% of subsection 212Ga.

A digital cover of the established RNA on the Allegheny National Forest (Allegheny Figure 2) is available in the projection used by the Allegheny National Forest from the Regional RNA Coordinator.

RNA-equivalents
Based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents for this assessment (Allegheny Table 2):

- State Natural Areas[3] and
- The Nature Conservancy's (TNC's) preserves[4].

However, RNA-equivalents with these designations still need to be identified for the Allegheny National Forest. Allegheny National Forest personnel can work with conservation partners to evaluate areas and additional designations as RNA-equivalents (Allegheny Table 3).

Subsection 212Ga

Natural Communties (Alliances)
At this time, 3 (9%) of the 32 alliances reported on the Allegheny National Forest in subsection 212Ga are represented by a high quality (A- or B-ranked) occurrence on Tionesta RNA. These 3 alliances are matrix alliances; thus 3 (60%) of the 5 matrix alliances are represented:

- Eastern Hemlock – Yellow Birch Forest Alliance
- American Beech – Sugar Maple – (Tuliptree) Forest Alliance
- Sugar Maple – Yellow Birch – (American Beech) Forest Alliance

None of the 6 large patch or 21 small patch alliances are represented.

IX.A.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes information relevant to representation for the Allegheny National Forest. Because the Allegheny National Forest occurs on only one subsection, our method of prioritizing subsections by prominence is not applicable. Instead, the alliances within the subsection may be prioritized. The *complete* list of needs is shown in Allegheny Table 5 by shaded cells that contain no number.

National forest personnel should critically review the list of alliances in the subsection to evaluate whether it should be modified or condensed for either ecological or administrative reasons. In addition, national forest personnel should review identify possible RNA-equivalents, then list gaps in representation. During this review, RNA needs for representation on the Forest can be prioritized, as well as integrated with other resource needs on the Forest.

---

[3] Subsection 212Ga occurs in both Pennsylvania and New York, so RNA-equivalents in both states are relevant.
[4] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

Subsection	Dominance Percentage of NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on NF lands	Percentage of NF alliances represented	Proposed priority
212Ga—Allegheny High Plateau	100	<0.01%	21	9	N/A*

*Subsections are not prioritized because there is only one.

Of 32 alliances, 3 are represented by Tionesta RNA. The two unrepresented matrix alliances may be the highest priority to represent:

- Eastern White Pine – Eastern Hemlock Forest Alliance
- Sugar Maple – White Ash – American Basswood Forest Alliance

RNA-equivalents have not yet been identified for the subsection. Thus a very critical need is the identification of RNA-equivalents and the alliances that they represent. Without this information it is difficult to summarize the need for alliance representation.

ALLEGHENY TABLES

Allegheny Table 1. Established research natural areas (RNAs) of the Allegheny National Forest

RNA	Acres	Subsection	Established
Tionesta RNA	2,113	212Ga	1940

Allegheny Table 2. Designations identified to date as RNA-equivalents for the Allegheny National Forest

Protected area designation	Managed by
all preserves of The Nature Conservancy (TNC)	The Nature Conservancy
State Natural Areas	Pennsylvania Dept. of Conservation and Natural Resources

Allegheny Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Allegheny National Forest

The Allegheny may work with these organizations to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Wilderness Areas	USDA. Forest Service
Tionesta Scenic Area	USDA. Forest Service
National Parks or National Scenic Riverways	USDI National Park Service
private natural areas	Western Pennsylvania Conservancy, other private organizations

Allegheny Table 4. Subsections of the Allegheny National Forest, in order of prominence

"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF Acres/Total Acres). "Dominance" is Allegheny NF acres divided by Allegheny National Forest total ownership. All values are approximate. See also VI.B."Identifying subsections and natural communities on national forest land," IX.A.2.a. "Subsections," and Allegheny Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF in subsection
212Ga—Allegheny High Plateau	2,446,633	513,162	21	100
Allegheny National Forest total ownership:		513,162		

Allegheny Table 5 [preliminary]. Subsections and alliances reported on Allegheny National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch). There is one subsection column for the one subsection of the Allegheny NF. The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on Tionesta RNA in the subsection are shown in each cell. RNA-equivalents have not yet been identified. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) AHP= Allegheny High Plateau. For a list of alliances occurring in the Allegheny NF subsection but not reported on NF land, see Allegheny Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsection of Allegheny NF

Community Pattern **Alliances Reported on NF Land**	212Ga (AHP)
Matrix Alliances **Rank: AB C**	
Eastern Hemlock - Yellow Birch Forest Alliance	1 •
Eastern White Pine - Eastern Hemlock Forest Alliance	•
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	1 •
Sugar Maple - White Ash - American Basswood Forest Alliance	•
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	1 •
Large Patch Alliances **Rank: AB C**	
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	•
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance	•
Red Oak - Sugar Maple - (White Oak) Forest Alliance	•
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	•
Eastern Cottonwood Temporarily Flooded Forest Alliance	•
Red Maple Seasonally Flooded Woodland Alliance	•
Small Patch Alliances **Rank: AB C**	
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance	•
Red Maple - Green Ash Seasonally Flooded Forest Alliance	•
River Birch - (Sycamore) Temporarily Flooded Forest Alliance	•
Eastern Hemlock Saturated Forest Alliance	•

Subsection of Allegheny NF

Community Pattern **Alliances Reported on NF Land**	212Ga (AHP)
Red Spruce - Red Maple Saturated Forest Alliance	▪
Black Ash - Red Maple Saturated Forest Alliance	▪
Red Maple - Black Gum Saturated Forest Alliance	▪
Black Spruce Saturated Woodland Alliance	▪
Black Willow Temporarily Flooded Shrubland Alliance	▪
Buttonbush Semipermanently Flooded Shrubland Alliance	▪
River Birch Temporarily Flooded Shrubland Alliance	▪
Smooth Alder Temporarily Flooded Shrubland Alliance	▪
Highbush Blueberry Saturated Shrubland Alliance	▪
American Cranberry Saturated Dwarf-Shrubland Alliance	▪
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	▪
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance	▪
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance	▪
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance	▪

Allegheny Table 6. RNAs and RNA-equivalents of the Allegheny National Forest

Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA. These have yet to be identified for the subsection.

Subsection	RNA (acres)	RNA-equivalents
212Ga	Tionesta RNA (2,113)	none identified to date

Allegheny Table 7. Summary of subsection representation on the Allegheny National Forest.

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect in each subsection

The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land. (RNA-equivalents have not yet been identified for the Allegheny National Forest.)

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Ga. Allegheny High Plateau	1	*unknown*	2,113		2,113 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)

Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for Representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land	Alliance representation			Low-quality*
		RNA	RNA-eq	Total	
212Ga. Allegheny High Plateau	32	3 *9%*		3 *9%*	

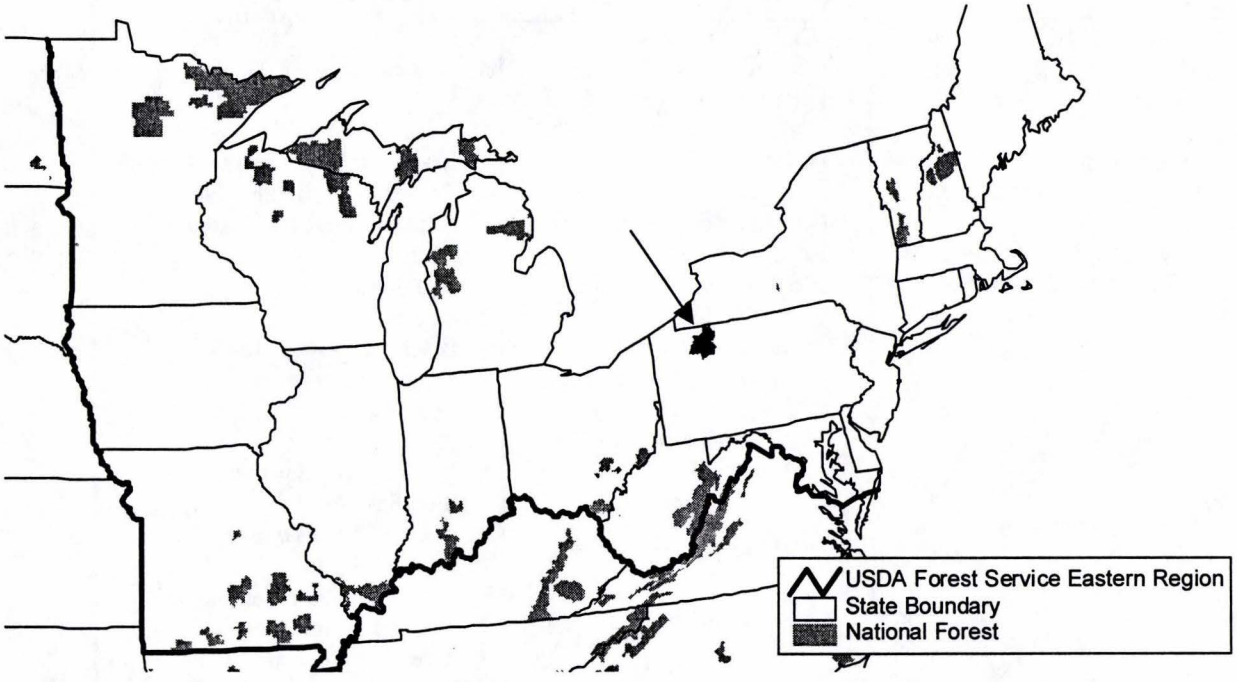
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.

Allegheny Table 8. Alliances of the Allegheny National Forest arranged by community pattern

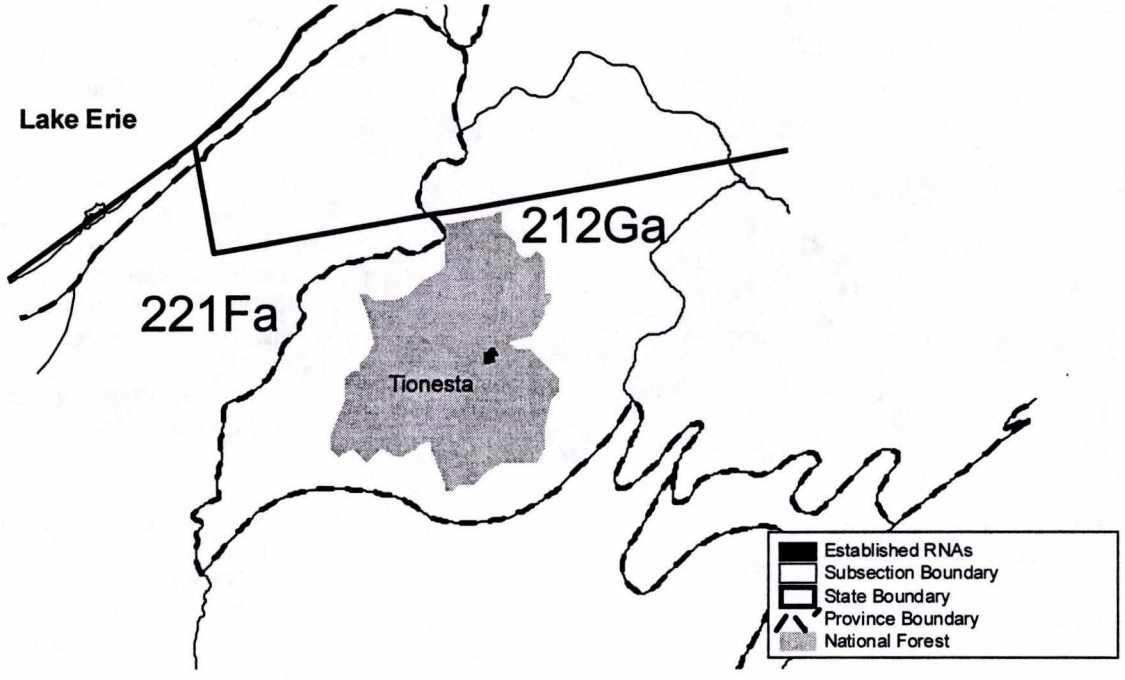
COMMUNITY PATTERN		
MATRIX	**LARGE PATCH**	**SMALL PATCH**
• Eastern Hemlock – Yellow Birch Forest • Eastern White Pine – Eastern Hemlock Forest • Sugar Maple – White Ash – American Basswood Forest (?) • Sugar Maple – Yellow Birch – (American Beech) Forest	• White Pine - (White Oak, Red Oak, Black Oak) Forest • (Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest • Red Oak - Sugar Maple - (White Oak) Forest • Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest • Eastern Cottonwood Temporarily Flooded Forest • Red Maple Seasonally Flooded Woodland	• (Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest • Red Maple - Green Ash Seasonally Flooded Forest • River Birch - (Sycamore) Temporarily Flooded Forest • Eastern Hemlock Saturated Forest • Red Spruce - Red Maple Saturated Forest • Black Ash - Red Maple Saturated Forest • Red Maple - Black Gum Saturated Forest • Black Spruce Saturated Woodland • Black Willow Temporarily Flooded Shrubland • Buttonbush Semipermanently Flooded Shrubland • River Birch Temporarily Flooded Shrubland • Smooth Alder Temporarily Flooded Shrubland • Highbush Blueberry Saturated Shrubland • American Cranberry Saturated Dwarf-Shrubland • Huckleberry (Black, Dwarf) Saturated Dwarf-Shrubland • Leatherleaf Saturated Dwarf-Shrubland • Canada Bluejoint Seasonally Flooded Herbaceous • Tussock Sedge Seasonally Flooded Herbaceous • Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous • Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous • Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous • Broadleaf Pondlily Permanently Flooded Temperate Herbaceous

ALLEGHENY FIGURES

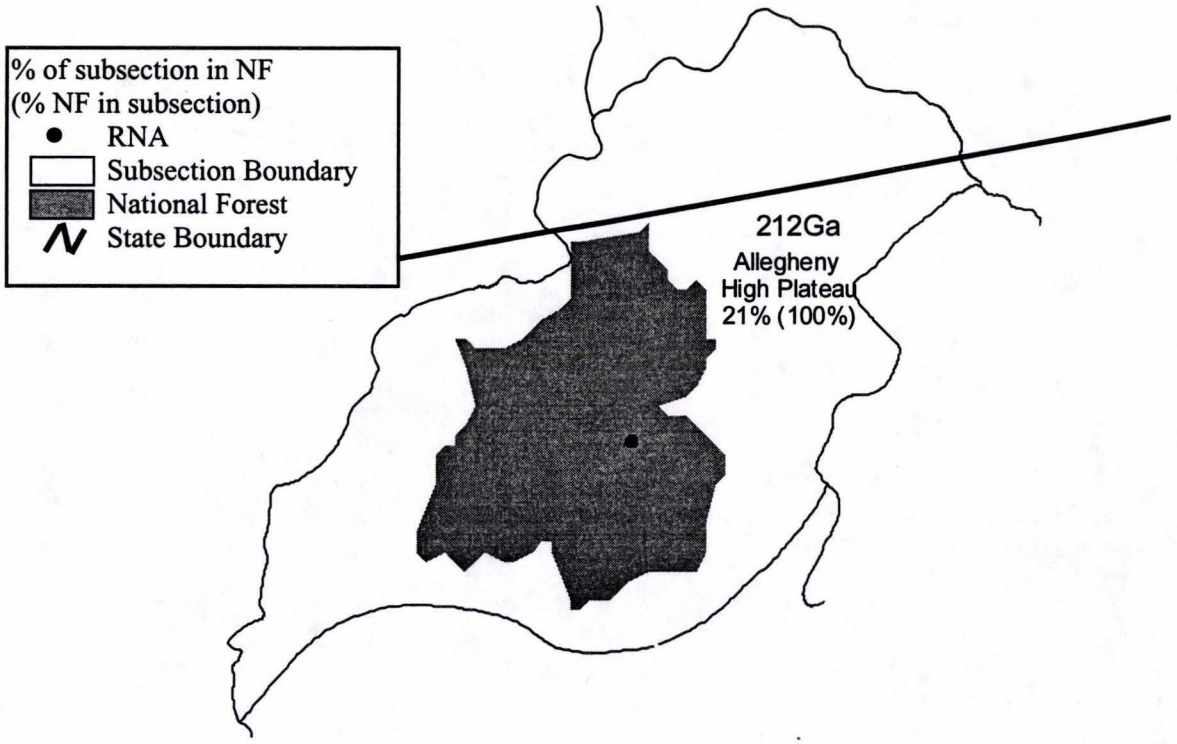
Allegheny Figure 1. Location of the Allegheny National Forest



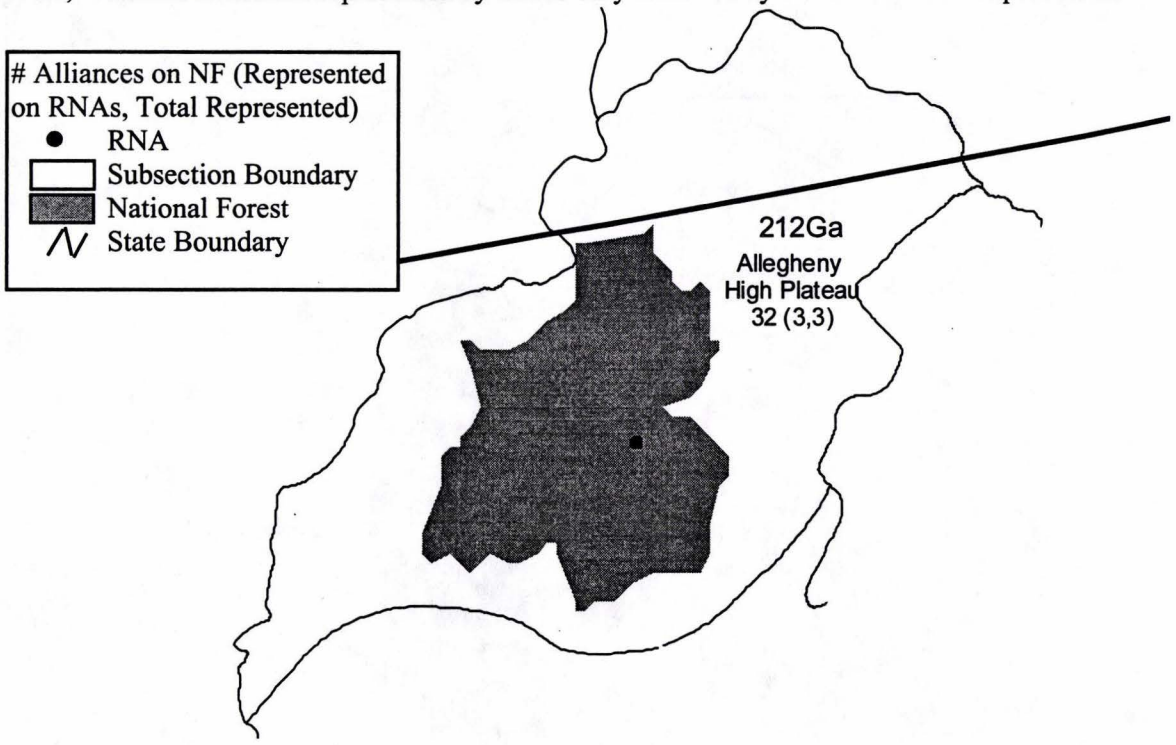
Allegheny Figure 2. The Allegheny National Forest with established RNA and subsections
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Allegheny Figure 3. Allegheny National Forest in relation to subsections.
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percentage of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percentage of national forest land (managed) in the subsection.



Allegheny Figure 4. Alliance representation on subsections of the Allegheny National Forest. The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on national forest land, and in parentheses, the number of these represented by RNAs only followed by the total number represented.



ALLEGHENY APPENDICES

Allegheny Appendix A. Subsections of the Allegheny National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Allegheny Table 5 for information on the format of this table. The difference between these two tables is that Allegheny Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Allegheny Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsection of Allegheny NF

Community Pattern **Alliances not Reported on NF Land**	212Ga (AHP)
Large Patch Alliances **Rank: AB C**	
White Pine Forest Alliance	▫
Black Oak - White Oak Forest Alliance	▪
Black Spruce Saturated Forest Alliance	▪
Red spruce - Balsam Fir Saturated Forest Alliance	▪
Small Patch Alliances **Rank: AB C**	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance	▪
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	▪
(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) Dwarf-shrubland Alliance	▪
Alpine Blueberry Dwarf-Shrubland Alliance	▪
Huckleberry (Black, Dwarf) Saturated Dwarf-Shrubland Alliance	▪
Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance	▫
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance	▫
Golden-saxifrage Saturated Herbaceous Alliance	▫

Allegheny Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Allegheny National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 212Ga. Allegheny High Plateau								
Matrix Alliances								
Eastern Hemlock - Yellow Birch Forest Alliance	Tionesta		1,644	A	U	B	AB	
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Tionesta		400	C	U	B	B*	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Tionesta		469	C	U	B	B*	
		Allegheny High Plateau (212Ga) Total:	2,513					
		Grand Total:	2,513					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.

* Rank assignment is uncertain.

IX. B. Chequamegon-Nicolet National Forest RNA Assessment

CHEQUAMEGON-NICOLET SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Chequamegon-Nicolet National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Chequamegon-Nicolet National Forest lands. The Chequamegon-Nicolet occupies portions of 11 subsections. Five of these subsections are also occupied by the Ottawa National Forest, and one by the Hiawatha National Forest. The Chequamegon-Nicolet shares with these National Forests and with other conservation partners the opportunity to represent the ecosystems found in these subsections.

Fifty alliances occur on Chequamegon-Nicolet National Forest lands, with the number of alliances in each subsection ranging from 3 to 46. There are 262 alliance-subsection combinations on Chequamegon-Nicolet lands; these are the ecosystems to represent for the Chequamegon-Nicolet National Forest. Of these alliance-subsection combinations, 191 also occur and could also be represented on the Ottawa or Hiawatha National Forests.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Twenty-two of the Chequamegon-Nicolet alliance-subsection combinations (ecosystems) are represented by the 10 currently established Chequamegon-Nicolet RNAs; an additional 2 are represented by the one established Hiawatha RNA located in 1 of the 11 subsections.

Existing **RNA-equivalents** in these subsections include:

- 85 Wisconsin State Natural Areas,
- 6 Michigan Natural Areas, and
- 10 preserves of The Nature Conservancy.

These 101 RNA-equivalents, along with the 11 RNAs, currently represent 51 (19%) of the Chequamegon-Nicolet alliance-subsection combinations (ecosystems). The number of represented alliance-subsection combinations is possibly larger, as we were unable to confidently identify alliances for many RNA-equivalents. Resolving these questions could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTED ECOSYSTEMS

The Chequamegon-Nicolet National Forest has 211 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents;
- evaluating areas with other designations as possible RNA-equivalents;
- establishing RNAs on the Chequamegon-Nicolet, Ottawa, and Hiawatha National Forests; and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Chequamegon-Nicolet National Forest are:

- Brule & Paint Rivers, Drumlinized Ground Moraine (212Jl);
- Winegar Moraines (212Jc); and
- Green Bay Lobe Stagnation Moraine (212Jj).

The Chequamegon-Nicolet has high prominence (> 10%) in these subsections, and fewer than 30% of the alliances are represented in each.

Medium-priority subsections are Central/Northwest Wisconsin Loess Plain (212Je), Perkinstown End Moraine (212Jf), Bayfield Sand Plains (212Ka), and Gogebic/Penokee Iron Range (212Jb). Chequamegon-Nicolet prominence in these subsections is less than 10%, but very little of the biological diversity (fewer than 10% of the alliances) is represented in these subsections.

Low-priority subsections are Northern Highlands Pitted Outwash (212Jm), Lake Superior Clay Plain (212Ja), West Green Bay Till Plain (212Hb), and Spread Eagle/Dunbar Barrens (212Jk) because Chequamegon-Nicolet prominence is less than 3% in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), there are 13 **high-priority alliances** (of 50 Chequamegon-Nicolet alliances). These may be high-priority in each subsection in which they occur. Six are not represented in *any* subsection in which they occur on Chequamegon-Nicolet land:

- Jack Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance

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IX.B.1. INTRODUCTION

The Chequamegon-Nicolet National Forest is located in northern Wisconsin (Chequamegon-Nicolet Figure 1). The proclamation boundaries contain 2,022,942 acres; 1,521,065 acres (75%) of this land is currently (FY97) managed by the Chequamegon-Nicolet National Forest.

The Hiawatha and Ottawa National Forests share subsections with the Chequamegon-Nicolet. The Ottawa National Forest is contiguous with the Nicolet portion along the Wisconsin border. Therefore the completion of a representative RNA network for the Chequamegon-Nicolet is closely tied to the work of the Hiawatha and Ottawa National Forests. The Chequamegon-Nicolet National Forest occurs entirely in Province 212 (Laurentian Mixed Forest Province). Overview Appendix VIII lists the other national forests in this Province. The Chequamegon-Nicolet National Forests can work with these national forests to evaluate province-wide representation and establish priorities for the Province.

IX.B.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Chequamegon-Nicolet.

IX.B.2.a. Subsections

A list of subsections for the Chequamegon-Nicolet National Forest was provided in the representative RNA pilot studies conducted in 1994 for both the Chequamegon and Nicolet. Subsection 212Hb was added by Eric Epstein of Wisconsin's Natural Heritage Program. To verify the subsection list, we overlaid a national digital copy of the Forest's proclamation boundaries (1972 data provided with ArcInfo) on the digital subsection map of Keys *et al.* (1995).

We also used these digital maps to determine the amount of land in each subsection within Chequamegon-Nicolet proclamation boundaries. We considered ownership acreage within each subsection as 75% of the acreage within proclamation boundaries, based on the ratio of ownership to proclamation acres for the entire Chequamegon-Nicolet National Forest in 1997. In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of Chequamegon-Nicolet National Forest land (ownership) in each subsection, and the percent of each subsection with Chequamegon-Nicolet National Forest land (ownership).

Ownership acreage by subsection for the Ottawa and Hiawatha National Forests was calculated using the same method. For the six subsections that the Chequamegon-Nicolet shares with these Forests, we added the additional national forest acres to the Chequamegon-Nicolet acres to calculate the percentage of total national forest land in each subsection (*dominance*) and the percentage of each subsection with national forest land (*prominence*).

In the results section, subsections are listed in order of prominence of Chequamegon-Nicolet land in each subsection. However, because of shared subsections, the staff of Chequamegon-Nicolet, Ottawa, and Hiawatha National Forests could agree to prioritize by prominence of *total* national forest land in each subsection.

IX.B.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for *Wisconsin*, we first used information provided in the Chequamegon and Nicolet 1994 pilot studies (see Section V.A.). These studies listed alliances occurring on national forest land in each subsection. Because the alliance classification had been modified since

1994, some translation of these alliances was necessary. The pilot data also include listings of aquatic types by subsection, using the Wisconsin Heritage classification. We did not include that information here.

State Heritage and national forest ecologists provided additional information, including alliances which occur in national forest subsections but not on national forest land. Alliances that occur on Forest Service lands are the focus of the RNA assessment. Eric Epstein, the Wisconsin Natural Heritage Ecologist reviewed the data.

In late 1997, associations (one level below alliance) were assigned to each community occurrence recorded in the Wisconsin Natural Heritage Program database. We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land. These data provided us with additional alliances in some subsections; the alliance lists have not been reviewed since these additions.

Alliance distributions in the *Michigan* portions of Wisconsin subsections came from national forest and State Ecologists, and were later supplemented by Element Occurrence data from the Michigan Heritage database.

IX.B.2.c. Identifying RNA-equivalents

RNA-equivalents in Wisconsin were identified in discussions of ecologists of the Chequamegon-Nicolet National Forest, the Wisconsin Department of Natural Resources, and the authors. RNA-equivalents in Michigan were identified in discussions of ecologists of the Ottawa, Hiawatha, and Huron-Manistee National Forests, Michigan Natural Features Inventory, and the authors. The RNA Committee of the Chequamegon-Nicolet National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency (Chequamegon-Nicolet Table 3).

IX.B.2.d. Digitizing RNAs

The Chequamegon-Nicolet National Forest provided USGS 7.5 minute (1:24,000 scale) topographical maps with outlines of RNA boundaries. Because RNA boundaries on the original quad sheets were thick, we traced them onto new unfolded paper quad sheets; some interpretation of boundary delineations was made. We hand-digitized the traced boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Chequamegon-Nicolet National Forest RNAs (Chequamegon-Nicolet Figure 2) in the projections used by the Chequamegon (UTM 15, NAD 83) and Nicolet (UTM 16, NAD 27), or a Lake States or Region-wide RNA cover at regional projections.

IX.B.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

Alliances were identified for Wisconsin RNAs as part of the 1994 Chequamegon and Nicolet pilot studies. Because the classification has changed since 1994, some revisions were required. We also compared the pilot results to the SAF cover types and vegetation descriptions in the RNA Establishment Records, and modified our results in some cases. The communities for Moquah RNA were provided by Quita Sheehan and Linda Parker of the Chequamegon-Nicolet National Forest, because there was insufficient information in the Establishment Record.

On the subsection shared with the Hiawatha, the Hiawatha has 1 established RNA. The communities on this RNA were identified using the RNA Establishment Record.

The Wisconsin Natural Heritage Program provided us with lists of communities for most Wisconsin State Natural Areas, which had been obtained through recent site surveys. The translation between the Wisconsin Heritage Program community types and alliances is not clean—many Heritage types correspond to multiple alliances—so there is low confidence for many of these assignments. Additional information for some sites came from the Wisconsin Heritage Program Element Occurrence database.

The list of Michigan Natural Areas, with total acreage and subsection for each, was provided by Kim Herman of the Michigan Natural Features Inventory. We were unable to obtain community information for these sites, except for the few sites with Element Occurrences (EOs) recorded in the Michigan Heritage database. In these cases the acres assigned to the type are the size of the EO, which may not be entirely contained by the Natural Area.

Nancy Braker and Jude McCall of the Wisconsin Field Office of The Nature Conservancy provided us with a list of Wisconsin TNC preserves and subsections, and a list of communities for 2 of these preserves. The communities were provided in the Wisconsin Heritage classification, so there are the same translation problems as for Wisconsin State Natural Areas. As no acreages were provided for these community occurrences, we could not rank them and therefore do not know if they represent the corresponding alliances. The occurrences are listed in Chequamegon-Nicolet Appendix B but do not appear in any other tables.

Complete community information for Michigan TNC preserves was provided by Doug Pearsall of the Michigan Field Office of The Nature Conservancy.

If we were very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Chequamegon-Nicolet Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Chequamegon-Nicolet National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.B.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Chequamegon-Nicolet National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.B.3.a. Subsections on national forest land

The 11 subsections which occur on Chequamegon-Nicolet National Forest land are (see also Chequamegon-Nicolet Table 4):

- Brule & Paint Rivers, Drumlinized Ground Moraine (212Jl)*
- Winegar Moraines (212Jc)*
- Green Bay Lobe Stagnation Moraine (212Jj)
- Bayfield Sand Plains (212Ka)
- Northern Highlands Pitted Outwash (212Jm)*
- Perkinstown End Moraine (212Jf)
- Central /Northwest Wisconsin Loess Plain (212Je)
- Spread Eagle/Dunbar Barrens (212Jk)
- West Green Bay Till Plain (212Hb)**
- Gogebic/Penokee Iron Range (212Jb)*
- Lake Superior Clay Plain (212Ja)*

These subsections are listed in order of *prominence*, the percent of the subsection on Chequamegon-Nicolet National Forest land.

The Ottawa National Forest (*) also occurs on 5 of these subsections: 212Jl, 212Jc, 212Jm, 212Jb, and 212Ja, and the Hiawatha National Forest (**) also occurs on Subsection 212Hb. The Chequamegon-Nicolet National Forest can work with these two national forests to represent the range of natural communities in each of these subsections.

The majority of Chequamegon-Nicolet National Forest land (ownership) occurs on 2 subsections (Chequamegon-Nicolet Table 4): 212Jl (35%) and 212Jc (28%). These subsections are also the subsections that contain the most Chequamegon-Nicolet land—approximately 35% of Subsection 212Jl and 15% of Subsection 212Jc— *i.e.*, the Chequamegon-Nicolet has high *prominence* of land coverage in these subsections. It manages less than 10% of the remaining 5 subsections that occur in the Ottawa. When Ottawa National Forest land is included, Subsection 212Jl is 43% national forest land, and Subsection 212Jc is 30% national forest land.

Subsections 212Jj and 212Je each occupy about 10% of Chequamegon-Nicolet land. In turn, about 14% of Subsection 212Jj and 8% of Subsection 212Je is on Chequamegon-Nicolet land. No other national forest land is in these subsections.

The remaining 7 subsections each occupy less than 10% of Chequamegon-Nicolet National Forest land (Chequamegon-Nicolet Table 4), and less than 10% these subsections are managed by the Chequamegon-Nicolet. The significance of national forest management in Subsections 212Jb, 212Ja, and 212Hb is higher when Ottawa and Hiawatha land is included. In fact, Chequamegon-Nicolet lands occupy only 4% of Subsection 212Jb, but 28% of the subsection is on national forest land; the additional 24% is on Ottawa land.

IX.B.3.b. Natural communities within subsections

A total of 79 alliances are reported to occur within these 11 subsections. Of these, 59 are known to be on national forest land (Chequamegon-Nicolet Table 5, first column); the 20 alliances not reported to occur on national forest land are listed in Chequamegon-Nicolet Appendix A. Nine of the "National Forest Alliances" have only been reported for the Ottawa or Hiawatha National Forests (Chequamegon-Nicolet Appendix D). While these 9 alliances are not considered to be ecosystems to represent for the Chequamegon-Nicolet in this assessment, they should be checked for presence on Chequamegon-Nicolet land.

> Two additional alliances occur on national forest lands but are **semi-natural/altered types** (see Glossary). As they are not natural communities they are not ecosystems to represent and are not part of this assessment.
>
> - Trembling Aspen - Oak - Willow Shrubland Alliance (occurs in 212Ka and 212Jk)
> - Bracken - Kalm's Brome Herbaceous Alliance (occurs in 212Jl, 212Jc, 212Jj, 212Ka, and 212Jm)
>
> Where they occur on an RNA or RNA-equivalent they are shown in Chequamegon-Nicolet Appendix B, but otherwise they do not appear in other tables and are not included in any alliance counts.

Of the 59 alliances occurring on national forest land, 13 are **matrix** alliances (see Chequamegon-Nicolet Table 5, first set of alliances), 26 are **large patch** (second set) and 20 are **small patch** (third set). (See "National Vegetation Classification" page 8-9). Of the 50 alliances reported on Chequamegon-Nicolet land, 13 are matrix, 22 are large patch, and 15 are small patch.

The number of alliances on national forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on *Chequamegon-Nicolet* National Forest land within each subsection:

- 212Jl (Brule & Paint Rivers): 37 alliances (9 matrix, 18 large patch, 10 small patch)
(an additional 2 matrix, 3 large patch, and 3 small patch are reported only on Ottawa in this subsection)
- 212Jc (Winegar Moraines): 29 alliances (9 matrix, 15 large patch, 5 small patch)
(an additional 4 matrix, 4 large patch, and 2 small patch are reported only on Ottawa in this subsection)
- 212Jj (Green Bay Lobe): 35 alliances (9 matrix, 16 large patch, 10 small patch)
- 212Je (Central /NW Wisconsin Loess): 23 alliances (6 matrix, 12 large patch, 5 small patch)
- 212Jf (Perkinstown End Moraine): 25 alliances (6 matrix, 14 large patch, 5 small patch)
- 212Ka (Bayfield Sand Plains): 23 alliances (6 matrix, 11 large patch, 6 small patch)
- 212Jb (Gogebic/Penokee Iron Range): 27 alliances (5 matrix, 15 large patch, 7 small patch)
(an additional 7 matrix, 4 large patch, and 3 small patch are reported only on Ottawa in this subsection)
- 212Jm (Northern Highlands): 33 alliances (11 matrix, 15 large patch, 7 small patch)
(no alliances in this subsection were reported exclusively on Ottawa land)
- 212Ja (Lake Superior Clay Plain): 5 alliances (3 matrix, 1 large patch, 1 small patch)
(an additional 6 matrix, 8 large patch, and 3 small patch are reported only on Ottawa in this subsection)
- 212Hb (West Green Bay Till Plain): 22 alliances (7 matrix, 10 large patch, 5 small patch)
(an additional 1 matrix and 2 large patch are reported only on Hiawatha in this subsection)
- 212Jk (Spread Eagle/Dunbar Barrens): 3 alliances (1 matrix, 2 large patch, 0 small patch)

Chequamegon-Nicolet Table 5 shows the alliances that occur in each subsection. It identifies those on national forest land, but does not distinguish between alliances on the Chequamegon-Nicolet, Ottawa, or Hiawatha when two national forests share a common subsection. Alliances found only on the Ottawa or Hiawatha are listed in Chequamegon-Nicolet Appendix D. Neither does the table distinguish between alliances that occur both on Chequamegon-Nicolet and either Ottawa or Hiawatha land, and those reported exclusively on the Chequamegon-Nicolet.

IX.B.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs (including the one on Hiawatha) and all RNA-equivalents in each subsection are shown in the appropriate cells of Chequamegon-Nicolet Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Chequamegon-Nicolet Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

There are 10 established RNAs on the Chequamegon-Nicolet National Forest (Chequamegon-Nicolet Tables 1 and 6). One Hiawatha RNA can also contribute to the representative network, because it occurs on a shared subsection.

There are 6 candidate RNAs (cRNAs) on the Chequamegon-Nicolet, and in shared subsections, there are 3 cRNAs on the Hiawatha and 2 cRNAs on the Ottawa. Candidate RNAs are not included in the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs of the Chequamegon-Nicolet National Forest (Chequamegon-Nicolet Figure 2) is available in the projections used by the Chequamegon (UTM15 NAD83)-Nicolet (UTM16 NAD27) National Forest from the Regional RNA Coordinator. A Regional RNA cover is also available.

RNA-equivalents

Some subsections of the Chequamegon-Nicolet National Forest occur in both Wisconsin and Michigan. Therefore RNA-equivalents in both states are relevant.

Chequamegon-Nicolet and Wisconsin Department of Natural Resources personnel have agreed that the following areas are RNA-equivalents (Chequamegon-Nicolet Table 2) in Wisconsin:

- all Wisconsin State Natural Areas (SNAs), and
- all of The Nature Conservancy's (TNC's) preserves.

Hiawatha, Ottawa, and Huron-Manistee National Forest, Michigan Natural Features Inventory, and The Nature Conservancy personnel have agreed that the following areas are RNA-equivalents (Chequamegon-Nicolet Table 2) in Michigan:

- Michigan Natural Areas (SNAs) on state-owned land that are documented and secure, and
- all of The Nature Conservancy's (TNC's) preserves.

Chequamegon-Nicolet National Forest personnel can work with conservation partners to evaluate additional designations possibly meriting RNA-equivalent status (Chequamegon-Nicolet Table 3). Certain portions of Wisconsin State Forests and Parks *may* meet the criteria for RNA-equivalency (Chequamegon-Nicolet Table 3).

In Wisconsin and Michigan, at present, no portions of State Wayside, or Wildlife Management Areas are RNA-equivalents. In Michigan no portions of State Forests or State Parks are RNA-equivalents. If the legal protection status (including management directives) of these areas is increased, then they could be reconsidered for RNA-equivalency.

Eighty-five Wisconsin State Natural Areas, 6 Michigan Natural Areas, 9 Wisconsin TNC preserves, and 1 Michigan TNC preserve serve as RNA-equivalents for the Chequamegon-Nicolet Forest (Chequamegon-Nicolet Table 7a). Other areas previously identified may be RNA-equivalents (see Appendix E).

We were unable to obtain community data for some RNA-equivalents, and for others our data are incomplete. Therefore there is likely a higher number of represented ecosystems than indicated below.

Subsection 212Jl (Brule and Paint Rivers-Drumlinized Ground Moraine)

This subsection is shared with the Ottawa National Forest. The two Forests can work together to represent ecosystems needing representation.

Subsection 212Jl contains 3 RNAs, together covering 1,100 acres (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Bose Lake (81 acres)
- Grandma Lake Wetlands (495 acres)
- McCaslin Mountain (524 acres).

The subsection also contains 9 Wisconsin State Natural Areas (SNAs; see Chequamegon-Nicolet Figure 3 and Chequamegon-Nicolet Tables 6, 7a):

- Atkins Lake
- Bastille Lake*
- Brule River Cliffs*
- Fox Maple Woods
- Giant White Pine Grove (235 acres)
- Glocke Lake
- Scott Lake-Shelp Lake Natural Area (272 acres)*
- Snow Falls Creek*
- Wisconsin Slough*

* No community data available at this time.

The 507 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was available for only 2 of the Wisconsin SNAs. Using this figure (underestimate), 1,607 acres (0.1%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 45 alliances reported to be on national forest land in Subsection 212Jl, 8 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Jl; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the 5 Wisconsin SNAs without community data.

Eight unrepresented alliances were reported to occur only on the Ottawa National Forest in this subsection (see Chequamegon-Nicolet Appendix D). Unless it is determined that these alliances *do* occur on Chequamegon-Nicolet land in this subsection, they are not ecosystems for the Chequamegon-Nicolet to represent in 212Jl.

This leaves 37 alliances to be represented on the Chequamegon-Nicolet in this subsection. Of 9 **matrix** alliances, 3 are represented and, of 18 **large patch** alliances, 5 are represented. None of the 10 **small patch** alliances are represented.

Two of the six unrepresented matrix alliances have a low-quality occurrence on RNA or RNA-equivalent:

- Eastern White Pine - Eastern Hemlock Forest Alliance (Giant White Pine Grove)
- White Spruce - Balsam Fir - Aspen Forest Alliance (Grandma Lake Wetlands RNA)

These occurrences (Chequamegon-Nicolet Appendix B) were given a BC rank because of their small size.

Subsection 212Jc (Winegar Moraines)

This subsection is shared with the Ottawa National Forest. The two Forests can work together to represent shared ecosystems needing representation.

Subsection 212Jc contains 2 RNAs, together covering 457 acres (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6-7):

- McCarthy Lake & Cedars (363 acres)
- Spider Lake (94 acres)

The subsection also contains 4 Wisconsin State Natural Areas (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Dunn Lake
- Mary Lake
- Moose Lake Hemlocks (40)
- Totagatic Highlands Hemlocks,

two Wisconsin TNC preserves:

- Crab Lake Preserve (130)*
- Flambeau Pines and Boreal Forest (220)*,

and one Michigan TNC preserve:

- Squaw Lake (67 acres).

* No community data available at this time.

The 457 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 3 of the Wisconsin State Natural Areas. Using this figure (underestimate), 914 acres (0.03%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 39 alliances reported to be on national forest land in Subsection 212Jc, 9 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Jc; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the 2 TNC preserves without community data.

One of the represented alliances and 9 of the unrepresented alliances were reported to occur only on the Ottawa National Forest in this subsection (Chequamegon-Nicolet Appendix D). Unless it is determined that these alliances *do* occur on Chequamegon-Nicolet land in this subsection, they are not ecosystems for the Chequamegon-Nicolet to represent in 212Jc.

This leaves 29 alliances to be represented on the Chequamegon-Nicolet in this subsection, and 8 of these are represented. Of 9 **matrix** alliances, 1 is represented, of 15 **large patch** alliances, 6 are represented, and, of 5 **small patch** alliances, 1 is represented.

Two of the seven unrepresented matrix alliances and 1 of the 9 unrepresented large patch alliances have a low-quality occurrence on McCarthy Lake & Cedars RNA:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (matrix--also given a BC-rank on Squaw Lake)
- Quaking Aspen - Paper Birch Forest Alliance (matrix)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (large patch)

These occurrences (Chequamegon-Nicolet Appendix B) were given a BC rank because of their small size.

Subsection 212Jj (Green Bay Lobe Stagnation Moraine)

Subsection 212Jj contains no RNAs, but does contain 17 Wisconsin State Natural Areas and 1 Wisconsin TNC preserve (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Barney Creek*
- Bear Caves
- Bogus Swamp
- Dalles of the St. Croix River
- Flora Spring Pond (160 acres)
- Interstate Lowland Forest
- Jung Hemlock-Beech Forest (80 acres)
- Keller Whitcomb Creek Woods
- Kissick Alkaline Bog Lake
- Minito Lake
- Mud Lake Bog
- Myklebust Lake
- New Hope Pines
- Oxbow Rapids, Upper Wolf River
- Plagge Woods (80 acres)
- Tranus Lake
- Tula Lake
- Battle Creek Outlet Forest (TNC, 313 acres)*

The acreages of most of the Wisconsin SNAs are unknown, so the reported 633 acres (0.06%) of the subsection (Chequamegon-Nicolet Table 7a) is an underestimate of the protection by RNA-equivalents.

Natural communities (alliances)

Of the 35 alliances reported to be on national forest land in Subsection 212Jj, 10 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Jj; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the 2 RNA-equivalents without community data.

* No community data available at this time.

Of 9 **matrix** alliances, 2 are represented, of 16 **large patch** alliances, 4 are represented, and, of 10 **small patch** alliances, 4 are represented.

Subsection 212Je (Central-Northwest Wisconsin Loess Plains)

Subsection 212Je contains no RNAs, but it does contain (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a) three Wisconsin SNAs:

- Flambeau River Hardwood Forest (360 acres)
- Gobler Lake (470 acres)
- Lake of the Pines Conifer-Hardwoods (156 acres),

and one Wisconsin TNC preserve:

- Upper North Fork of the Flambeau River (51 acres)*.

Together these RNA-equivalents cover 1,037 acres, or 0.05% of the subsection (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 23 alliances reported to be on national forest land in Subsection 212Je, 2 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Je; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the TNC preserve without community data.

Of 6 **matrix** alliances, 1 is represented and, of 12 **large patch** alliances, 1 is represented. None of the 5 **small patch** alliances are represented.

Subsection 212Jf (Perkinstown End Moraine)

Subsection 212Jf contains 1 RNA (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Twin Lakes Bog (38 acres)

and 1 Wisconsin SNA (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Blue Hills Felsenmeer (75 acres)

Thus 133 acres (0.01%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 25 alliances reported to be on national forest land in Subsection 212Jf, one alliance is currently represented by a high-quality (A- or B-ranked) occurrence on an RNA (Chequamegon-Nicolet Table 5, column 212Jf; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4):

- Tamarack Saturated Forest Alliance

Two additional alliances are represented on an RNA-equivalent in the subsection, but these alliances have not been reported to occur on national forest land in the subsection.

None of the 6 **matrix** or 5 **small patch** alliances are represented. One of 14 **large patch** alliances is represented.

One of the 13 unrepresented large patch alliances has a low-quality occurrence on Twin Lakes Bog RNA:

- Leatherleaf Saturated Dwarf-Shrubland Alliance

This occurrence (Chequamegon-Nicolet Appendix B) was given a BC rank because of its small size.

* No community data available at this time.

Subsection 212Ka (Bayfield Sand Plains)

Subsection 212Ka contains 1 RNA of 640 acres (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Moquah

The subsection also contains 11 Wisconsin SNAs and 1 Wisconsin TNC preserve (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6-7):

- Bois-Brule Conifer Bog
- Brant Brook Pines and Hardwoods
- Crex Sand Prairie (Barrens) (79 acres)
- Ekdall Wetlands
- Kohler-Peet Barrens and Cedar Swamp
- Lampson Moraine Pines (120 acres)
- Norway Point Bottomlands
- Solon Springs Sharptail Barrens (240 acres)
- St. Croix Ash Swamp
- Sterling Barrens
- Upper Brule River
- Brule River (TNC; 4,958 acres)*

The 5,397 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 8 of the Wisconsin SNAs. Using this figure, 6,037 acres (0.5%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7).

Natural communities (alliances)

Of the 23 alliances reported to be on national forest land in Subsection 212Ka, 5 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Ka; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the TNC preserve without community data.

Of 6 **matrix** alliances, 1 is represented:

- Jack Pine - (Red Pine) Wooded Herbaceous Alliance[5]

Of 11 **large patch** alliances, 1 is represented, and, of 6 **small patch** alliances, 3 are represented.

Three of the five unrepresented matrix alliances and 1 of the 10 unrepresented large patch alliances have a low-quality occurrence on an RNA or RNA-equivalent:

- Jack Pine Forest Alliance (matrix—Moquah RNA)
- Red Pine Forest Alliance (matrix—Lampson Moraine Pines)
- Quaking Aspen - Paper Birch Forest Alliance (matrix—Moquah RNA)
- Quaking Aspen - Forest Alliance (large patch—Moquah RNA)

These occurrences (Chequamegon-Nicolet Appendix B) were given a BC rank because of their small size.

Subsection 212Jb (Gogebic/Penokee Iron Range)

This subsection is shared with the Ottawa National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

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[5] Jack Pine - (Red Pine) Wooded Herbaceous Alliance (pine barrens) is listed for Moquah RNA, and is considered represented because it was given an AB rank. The RNA committee of the Chequamegon-Nicolet will need to decide if this is an appropriate rank given the decades-long exclusion of fire at the site. Other alliances listed for Moquah RNA include modified vegetation types that can be considered degraded forms of the original jack pine barrens: Trembling Aspen - Oak - Willow Shrubland Alliance and Bracken - Kalm's Brome Herbaceous Alliance. These are not considered natural community types and are not included in this assessment. (They are listed in Chequamegon-Nicolet Appendix B).

* No community data available at this time.

Subsection 212Jb contains 1 RNA of 80 acres (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a),

- Chequamegon Hardwoods,

An additional 1 acre is protected by 1 Michigan Natural Area (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Fort Wilkins State Park Site*.

Thus 81 acres (0.008%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 40 alliances reported to be on National Forest land in Subsection 212Jb, 1 is currently represented by a high-quality (A- or B-ranked) occurrence on Chequamegon Hardwoods RNA (Chequamegon-Nicolet Table 5, column 212Ka; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4):

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (matrix).

Additional alliances may be represented on the Michigan Natural Area without community data.

Thirteen unrepresented alliances were reported to occur only on the Ottawa National Forest in this subsection (Chequamegon-Nicolet Appendix D). Unless it is determined that these alliances *do* occur on Chequamegon-Nicolet land in this subsection, they are not ecosystems for the Chequamegon-Nicolet to represent in 212Jb.

This leaves 27 alliances to be represented on the Chequamegon-Nicolet in this subsection. One of five **matrix** alliances is represented, and none of the 15 **large patch** or 7 **small patch** alliances are represented.

One of the 15 unrepresented large patch alliances has a low-quality occurrence on Chequamegon Hardwoods RNA:

- Black Ash - Red Maple Saturated Forest Alliance

This occurrence (Chequamegon-Nicolet Appendix B) was given a BC rank because of its small size.

Subsection 212Jm (Northern Highlands Pitted Outwash)

This subsection is shared with the Ottawa National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

Subsection 212Jm contains 2 RNAs, together covering 222 acres (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Memorial Grove Hemlocks (64 acres)
- Tucker Lake Hemlocks (158 acres)

The subsection also contains 23 Wisconsin SNAs and 1 Wisconsin TNC preserve (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Aurora Lake (250 acres)
- Bass Lake Preserve
- Bittersweet Lakes (498 acres)
- Black Tern Bog (26 acres)
- Day Lake
- Escanaba Lake Hemlocks (130 acres)
- Finnerud Pine Forest (120 acres)
- Frog Lake and Pines
- Goodyear Springs-East
- High Lake Spruce-Balsam Forest (40 acres)
- Holmboe Conifer Forest (32 acres)
- Johnson Lake Barrens (105 acres)
- Moose Lake
- Patterson Hemlocks

* No community data available at this time.

- Pine-Oak Grove*
- Plum Lake Hemlock Forest (200 acres)
- Rice Lake-Thunder Lake Marsh (250 acres)
- Squirrel River Pines
- Stone Lake Pines
- Tomahawk River Pines
- Trout Lake Conifer Swamp (25 acres)
- Turtle-Flambeau Flowage*
- Wind Pudding Lake
- Clifford F. Messinger Bass Lake Preserve (TNC; 570 acres)*

The 2,246 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 11 of the Wisconsin SNAs. Nevertheless, using this figure, 2,468 acres (0.2%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 33 alliances reported to be on national forest land in Subsection 212Jm, 12 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Jm; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Additional alliances may be represented on the 2 Wisconsin SNAs and 1 TNC preserve without community data.

Of 11 **matrix** alliances, 5 are represented; of 15 **large patch** alliances, 5 are represented; and, of 7 **small patch** alliances, 2 are represented.

Although some alliances in this subsection are shared with the Ottawa, none of the alliances were reported exclusively for the Ottawa.

Two of the six unrepresented matrix alliances, 2 of the 10 unrepresented large patch alliances, and 1 of the 5 unrepresented small patch alliances have a low-quality occurrence on an RNA or RNA-equivalent:

- Eastern White Pine - Eastern Hemlock Forest Alliance (matrix--Homboe Conifer Forest)
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (matrix--Tucker Lake Hemlocks RNA)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (large patch--Holmboe Conifer Forest and Trout Lake Conifer Swamp)
- Northern White Cedar Saturated Forest Alliance (large patch--Trout Lake Conifer Swamp)
- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (small patch--Tucker Lake Hemlocks RNA)

These occurrences (Chequamegon-Nicolet Appendix B) were given a BC rank because of their small size.

Subsection 212Ja (Lake Superior Clay Plain)

This subsection is shared with the Ottawa National Forest. The 2 Forests can work together to represent shared alliances.

Subsection 212Ja contains no RNAs, but it does contain (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a) seven Wisconsin SNAs:

- Bark Bay Slough (113 acres)
- Bibon Swamp
- Big Bay Sand Spit and Bog
- Dwight's Point & Pokegama Wetlands*
- Lost Creek Bog
- Port Wing Boreal Forest
- Sajdak Springs,

three Michigan Natural Areas:

- Porcupine Mountains (47,671 acres)*
- Union Springs Scenic Site (160 acres)*,

* No community data available at this time.

- Presque Isle River Scenic Site (1,465 acres)*

and three Wisconsin TNC preserves:

- Chequamegon Point (40 acres)*
- Kakagon Sloughs (81 acres)
- Squaw Bay (12 acres)*

The 49,542 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 6 Wisconsin SNAs. Using this figure, 4% of the subsection is protected by RNA-equivalents (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 22 alliances reported to be on national forest land in Subsection 212Ja, 2 are currently represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Ja; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4). Both of these alliances have been reported only on Ottawa National Forest land in this subsection:

- White Spruce - Balsam Fir - Aspen Forest Alliance (matrix)
- Black Ash - Red Maple Saturated Forest Alliance (large patch)

Fifteen unrepresented alliances were also reported to occur only on the Ottawa National Forest in this subsection (Chequamegon-Nicolet Appendix D). Unless it is determined that these alliances *do* occur on Chequamegon-Nicolet land in this subsection, they are not ecosystems for the Chequamegon-Nicolet to represent in 212Ja.

This leaves 5 alliances to be represented on the Chequamegon-Nicolet in this subsection, and none of these are represented (3 matrix, 1 large patch, 1 small patch).

Additional alliances may be represented on the 1 Wisconsin SNA, 3 Michigan Natural Areas, and 2 TNC preserves without community data.

Subsection 212Hb (West Green Bay Till Plain)

This subsection is shared with the Hiawatha National Forest. The 2 Forests can work together to represent shared alliances.

Subsection 212Hb contains 1 RNA of 233 acres on Hiawatha National Forest (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a),

- Dukes RNA

The subsection also contains 5 Wisconsin SNAs (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a):

- Hortonville Bog
- Mukwa Bottomland Forest
- Poppy's Rock (20 acres)
- Shaky Lake
- Tellock's Hill Woods (32)

The 52 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 3 of the Wisconsin SNAs. Thus, at least 285 acres (0.01%) of the subsection are protected by RNAs and RNA-equivalents (Chequamegon-Nicolet Table 7a).

* No community data available at this time.

Natural communities (alliances)

Of the 25 alliances reported to be on national forest land in Subsection 212Hb, 3 are currently represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Chequamegon-Nicolet Table 5, column 212Hb; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4).

Three unrepresented alliances were reported to occur only on the Hiawatha National Forest in this subsection (Chequamegon-Nicolet Appendix D). Unless it is determined that these alliances *do* occur on Chequamegon-Nicolet land in this subsection, they are not ecosystems for the Chequamegon-Nicolet to represent in 212Hb.

This leaves 22 alliances to be represented on the Chequamegon-Nicolet in this subsection. Of 7 **matrix** alliances, 1 is represented and, of 10 **large patch** alliances, 2 are represented. None of the 5 **small patch** alliances are represented.

Two of the six unrepresented matrix alliances and 1 of the 5 unrepresented small patch alliances have a low-quality occurrence on an RNA or RNA-equivalent:

- Eastern Hemlock - Yellow Birch Forest Alliance (matrix--Dukes RNA)
- Eastern Hemlock Forest Alliance (matrix--Dukes RNA)
- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (small patch--Shaky Lake)

These occurrences (Chequamegon-Nicolet Appendix B) were given a BC or C rank because of their small size.

Subsection 212Jk (Spread Eagle-Dunbar Barrens)

Subsection 212Jk contains no RNAs, but it does contain (Chequamegon-Nicolet Figure 3, Chequamegon-Nicolet Tables 6, 7a) five Wisconsin SNAs:

- Dunbar Barrens (240 acres)
- Hagar Mountain*
- Marinette Co. Beech Forest (40 acres)
- Miscauno Cedar Swamp (635 acres)
- Spread Eagle Barrens,

and two Michigan Natural Areas:

- Gene's Pond (921 acres)*
- Shakey Lakes (1,520 acres)*

The 3,356 acres of RNA-equivalent land area shown in Chequamegon-Nicolet Table 7a is an underestimate, because acreage information was unavailable for 2 of the Wisconsin SNAs. Using this figure, the RNA-equivalents cover 0.3% of the subsection (Chequamegon-Nicolet Table 7a).

Natural communities (alliances)

Of the 3 alliances reported to be on national forest land in Subsection 212Jk, 1 is currently represented by a high-quality (A- or B-ranked) occurrence on Miscauno Cedar Swamp (Chequamegon-Nicolet Table 5, column 212Jk; Chequamegon-Nicolet Table 7b; Chequamegon-Nicolet Figure 4):

- Northern White Cedar Saturated Forest Alliance

One of the two **large patch** alliances is represented. The 1 **matrix** alliance is not represented. There are no small patch alliances reported on national forest land in this subsection.

Additional alliances may be represented on the 1 Wisconsin SNA and 2 Michigan Natural Areas without community data.

* No community data available at this time.

IX.B.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Chequamegon-Nicolet National Forest (C-N NF). The suggested priority ranking (last column) of subsections is based on both prominence, *i.e.*, the percentage of the subsection that is on national forest lands (fourth column) and on current representation of biological variation, *i.e.*, the percentage of alliances represented (fifth column). Dominance of the subsection, *i.e.*, the percentage of national forest land that is in each subsection (second column), and percentage of subsection land area represented (third column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Chequamegon-Nicolet Table 5 by shaded cells which contain no number. Alliances that are not represented in any Chequamegon-Nicolet subsection (unrepresented Forest-wide) are listed in Chequamegon-Nicolet Appendix C.

Subsection	Dominance Percentage of C-N NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on C-N NF lands	Percentage of NF alliances represented	Proposed priority
212Jl (Brule & Paint Rivers, Drumlinized Ground Moraine)	35	0.1	35 (43*)	22 (18*)	high
212Jc (Winegar Moraines)	28	0.03	15 (30*)	31 (23*)	high
212Jj (Green Bay Lobe Stagnation Moraine)	10	0.06	14	29	high
212Je (Central /Northwest Wisconsin Loess Plain)	10	0.05	8	9	med.
212Jf (Perkinstown End Moraine)	4	0.01	7	4	med.
212Ka (Bayfield Sand Plains)	5	0.05	6.9	22	med.
212Jb (Gogebic/Penokee Iron Range)	2	0.003	4 (28*)	4 (3*)	med.
212Jm (Northern Highlands Pitted Outwash)	2	0.2	2 (3*)	36 (36*)	low
212Ja (Lake Superior Clay Plain)	1	4	1 (5*)	0 (9*)	low
212Hb (West Green Bay Till Plain)	2	0.01	0.9 (2**)	14 (12**)	low
212Jk (Spread Eagle/Dunbar Barrens)	0.02	0.3	0.02	33	low

* Value when Ottawa lands and alliances are included.
** Value when Hiawatha lands and alliances are included.

The level of alliance representation in all subsections is low to moderately low, and Chequamegon-Nicolet prominence ranges widely among subsections. Therefore, subsections can be prioritized by prominence alone, and our proposed priority order is same as the ordering of subsections by Chequamegon-Nicolet prominence. Using this approach, the high-priority subsections are Brule & Paint Rivers, Drumlinized Ground Moraine (212Jl), Winegar Moraines (212Jc), and Green Bay Lobe Stagnation Moraine (212Jj).

In terms of land area, the "low" priority subsections (212Jk, 212Hb, 212Ja, and 212Jm) are of marginal prominence, but they should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

The Chequamegon-Nicolet RNA committee may also want to take *total* national forest prominence into account when deciding which subsections are more important for RNA establishment. In particular, Subsection 212Jb is only 4% Chequamegon-Nicolet land, but the total national forest ownership is 28%, the third highest of all subsections. This subsection is also one of the least represented. The RNA committees of the Chequamegon-Nicolet and Ottawa National Forests could make this a high-priority subsection for collaboration and RNA establishment.

Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection (Chequamegon-Nicolet Table 5), or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

Subsection 212Jl (Brule and Paint Rivers-Drumlinized Ground Moraine)

Of 37 alliances, 8 are represented, leaving 29 alliances (78%) unrepresented (Chequamegon-Nicolet Figure 3).

The 6 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance* (Giant White Pine Grove)
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance* (Grandma Lake Wetlands RNA)

The 2 marked (*) alliances have a low-quality occurrence on RNA or RNA-equivalent (Chequamegon-Nicolet Table 7b, Appendix B). The quality/viability of these occurrences should be verified.

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin SNAs, for which we currently have no community data:

- Bastille Lake
- Brule River Cliffs
- Scott Lake-Shelp Lake
- Snow Falls Creek
- Wisconsin Slough

The Chequamegon-Nicolet shares this subsection with the Ottawa National Forest. It is not necessary for both Forests to represent the same alliances. The 8 alliances reported on only Ottawa National Forest land in this subsection (Chequamegon-Nicolet Appendix D) should be checked for presence on Chequamegon-Nicolet land to verify that they are indeed restricted to the Ottawa.

Subsection 212Jc (Winegar Moraines)

Of 39 alliances, 9 are represented, leaving 20 alliances (69%) in unrepresented (Chequamegon-Nicolet Figure 3).

The 11 unrepresented matrix types may be of highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance

- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance* (McCarthy Lake & Cedars RNA, Squaw Lake)
- Quaking Aspen - Paper Birch Forest Alliance* (McCarthy Lake & Cedars RNA)
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

The 2 marked (*) alliances have a low-quality occurrence on RNA or RNA-equivalent (Chequamegon-Nicolet Table 7b, Appendix B). The quality/viability of these occurrences should be verified.

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin TNC preserves, for which we currently have no community data:

- Crab Lake Preserve
- Flambeau Pines and Boreal Forest

One of the unrepresented large patch alliances also has a low-quality occurrence on McCarthy Lake & Cedars RNA and its quality/viability should be verified:

- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance

The Chequamegon-Nicolet shares this subsection with the Ottawa National Forest. It is not necessary for both Forests to represent the same alliances. The 10 alliances reported on only Ottawa National Forest land in this subsection (Chequamegon-Nicolet Appendix D) should be checked for presence on Chequamegon-Nicolet land to verify that they are indeed restricted to the Ottawa.

Forest Service RNA-equivalents should be identified for the Nicolet.

Subsection 212Jj (Green Bay Lobe Stagnation Moraine)

Of 35 alliances, 10 are represented, leaving 25 alliances (71%) in unrepresented (Chequamegon-Nicolet Figure 3).

The 7 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern Hemlock Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin SNA:

- Barney Creek

and TNC preserve:

- Battle Creek Outlet Forest.

Subsection 212Je (Central-Northwest Wisconsin Loess Plains)

Of 23 alliances, 2 are represented, leaving 21 alliances (91%) unrepresented (Chequamegon-Nicolet Figure 3).

The 5 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin TNC preserve, for which we currently have no community data:

- Upper North Fork of the Flambeau River

Subsection 212Jf (Perkinstown End Moraine)

Of 25 alliances, 1 is represented, leaving 24 alliances (96%) in unrepresented (Chequamegon-Nicolet Figure 3).

The 6 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

One of the 13 unrepresented large patch alliances has a low-quality occurrence on Twin Lakes Bog RNA. The quality/viability of this occurrence should be verified:

- Leatherleaf Saturated Dwarf-Shrubland Alliance

Subsection 212Ka (Bayfield Sand Plains)

Of 23 alliances, 5 are represented, leaving 18 alliances (78%) unrepresented (Chequamegon-Nicolet Figure 3).

The 5 unrepresented matrix types may be of highest priority for RNA establishment:

- Jack Pine Forest Alliance* (Moquah RNA)
- Red Pine Forest Alliance* (Lampson Moraine Pines)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance* (Moquah RNA)

The 3 marked (*) alliances have a low-quality occurrence on RNA or RNA-equivalent (Chequamegon-Nicolet Table 7b, Appendix B). The quality/viability of these occurrences should be verified.

One of the unrepresented large patch alliances also has a low-quality occurrence on Moquah RNA, and its quality/viability should be verified:

- Quaking Aspen - Paper Birch Forest Alliance

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin TNC preserve, for which we currently have no community data:

- Brule River

Subsection 212Jb (Gogebic/Penokee Iron Range)

Of 27 alliances, 1 is represented, leaving 26 alliances (96%) unrepresented (Chequamegon-Nicolet Figure 3).

The 4 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

One of the unrepresented large patch alliances has a low-quality occurrence on Chequamegon Hardwoods RNA. The quality/viability of this occurrence should be verified:

- Black Ash - Red Maple Saturated Forest Alliance

Some alliances may be represented if high-quality alliances are identified on the following Michigan Natural Area, for which we currently have no community data:

- Fort Wilkins State Park Site

The Chequamegon-Nicolet shares this subsection with the Ottawa National Forest. It is not necessary for both Forests to represent the same alliances. The 13 alliances reported on only Ottawa National Forest land in this subsection (Chequamegon-Nicolet Appendix D) should be checked for presence on Chequamegon-Nicolet land to verify that they are indeed restricted to the Ottawa.

Subsection 212Jm (Northern Highlands Pitted Outwash)

Of 33 alliances, 12 are represented, leaving 21 alliances (64%) unrepresented (Chequamegon-Nicolet Figure 3).

The 6 unrepresented matrix types may be of highest priority for RNA establishment:

- Jack Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance* (Holmboe Conifer Forest)
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance* (Tucker Lake Hemlocks RNA)

The 2 marked (*) alliances have a low-quality occurrence on RNA or RNA-equivalent (Chequamegon-Nicolet Table 7b, Appendix B). The quality/viability of these occurrences should be verified.

Two of the 10 unrepresented large patch alliances and 1 of the 5 unrepresented small patch alliances also have a low-quality occurrence on an RNA or RNA-equivalent, and their quality/viability ranks should be verified:

- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (Holmboe Conifer Forest, Trout Lake Conifer Swamp)
- Northern White Cedar Saturated Forest Alliance (Trout Lake Conifer Swamp)
- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (Tucker Lake Hemlocks RNA)

Some alliances may be filled if high-quality alliances are identified on the following Wisconsin SNAs:

- Pine Oak Grove
- Turtle-Flambeau Flowage

and TNC preserve:

- Clifford F. Messinger Bass Lake Preserve

The Chequamegon-Nicolet shares this subsection with the Ottawa National Forest. It is not necessary for both Forests to represent the same alliance.

Subsection 212Ja (Lake Superior Clay Plain)

None of 5 alliances are represented (Chequamegon-Nicolet Figure 3). The 3 matrix types may be of highest priority for RNA establishment:

- White Pine Forest
- White Spruce - Balsam Fir Forest
- Quaking Aspen - Paper Birch Forest

Some alliances may be represented if high-quality alliances are identified on the following Wisconsin SNA:

- Dwight's Point & Pokegama Wetlands

Michigan Natural Areas:

- Porcupine Mountains
- Presque Isle River Scenic Site
- Union Springs Scenic Site,

and Wisconsin TNC preserves:

- Chequamegon Point
- Squaw Bay.

The Chequamegon-Nicolet shares this subsection with the Ottawa National Forest. It is not necessary for both Forests to represent the same alliance. The 17 alliances reported on only Ottawa National Forest land in this subsection (Chequamegon-Nicolet Appendix D) should be checked for presence on Chequamegon-Nicolet land to verify that they are indeed restricted to the Ottawa.

Subsection 212Hb (West Green Bay Till Plain)

Of 22 alliances, 3 are represented, leaving 19 alliances (86%) unrepresented (Chequamegon-Nicolet Figure 3).

The 6 unrepresented matrix types may be of highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance* (Dukes RNA)
- Eastern Hemlock Forest Alliance* (Dukes RNA)
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

The 2 marked (*) alliances have a low-quality occurrence on Dukes RNA (Chequamegon-Nicolet Table 7b, Appendix B). The quality/viability of these occurrences should be verified.

One of the unrepresented small patch alliances also has a low-quality occurrence, and its quality/viability should be verified:

- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (Shaky Lake)

The Chequamegon-Nicolet shares this subsection with the Hiawatha National Forest. It is not necessary for both Forests to represent the same alliance. The 3 alliances reported on only Hiawatha National Forest land in this subsection (Chequamegon-Nicolet Appendix D) should be checked for presence on Chequamegon-Nicolet land to verify that they are indeed restricted to the Hiawatha.

Subsection 212Jk (Spread Eagle-Dunbar Barrens)

Of 3 alliances, 1 is represented, leaving 2 alliances (67%) unrepresented (Chequamegon-Nicolet Figure 3).

The 1 unrepresented matrix type is:

- Quaking Aspen - Paper Birch Forest Alliance

Some alliances may be filled if high-quality alliances are identified on the following Wisconsin SNA:

- Hagar Mountain

and Michigan Natural Areas:

- Gene's Pond
- Shakey Lakes.

CHEQUAMEGON-NICOLET TABLES

Chequamegon-Nicolet Table 1. Established research natural areas of subsections of the Chequamegon-Nicolet National Forest

RNA	Acres	Subsection	Established	National Forest
Bose Lake	81	212Jl	1992	Nicolet
Chequamegon Hardwoods	80	212Jb	1988	Chequamegon
Dukes	233	212Hb	1974	Hiawatha
Grandma Lake Wetlands	495	212Jl	1991	Nicolet
McCarthy Lake & Cedars	363	212Jc	1989	Chequamegon
McCaslin Mountain	524	212Jl	1992	Nicolet
Memorial Grove Hemlocks	64	212Jm	1989	Chequamegon
Moquah	640	212Ka	1936	Chequamegon
Spider Lake	94	212Jc	1989	Chequamegon
Tucker Lake Hemlocks	158	212Jm	1991	Chequamegon
Twin Lakes Bog	38	212Jf	1989	Chequamegon

Chequamegon-Nicolet Table 2. Designations identified as RNA-equivalents for the Chequamegon-Nicolet National Forest

Protected Area Designation	Managed by
all Wisconsin State Natural Areas	Wisconsin Department of Natural Resources
Michigan Natural Areas on state-owned land that are documented and secure	Michigan Natural Features Inventory
all preserves of The Nature Conservancy	The Nature Conservancy (private) field offices in Wisconsin and Michigan

Chequamegon-Nicolet Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Chequamegon-Nicolet National Forest

Protected Area Designation	Managed by
Special Areas, including Wilderness	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities
special conservation designations within Wisconsin State Parks	Wisconsin Department of Natural Resources
special conservation designations within Wisconsin State Forests	Wisconsin Department of Natural Resources
Environmental Areas	Great Lakes Program
Research Natural Areas	US Fish & Wildlife Service Michigan Parks and Recreation
Michigan Quiet Areas	Michigan Forest Management Division
Michigan Wilderness State Park	Michigan Parks and Recreation
Michigan Critical Dune Area	Michigan Land & Water Management

Chequamegon-Nicolet Table 4. Subsections of the Chequamegon-Nicolet National Forest in order of prominence

The two "NF acres" columns show the approximate number of ownership acres of national forest (NF) land in each subsection. "C-N NF acres" is Chequamegon-Nicolet National Forest land and "additional NF acres" is Hiawatha or Ottawa NF land in the same subsection. "Prominence" is the percentage of the subsection that is on national forest land: the first number is Chequamegon-Nicolet land only ("C-N NF acres"/"Total subsection acres") and in parentheses is total NF land (("C-N" + "additional" NF acres)/"Total subsection acres"). These percentages do not add to 100. "Dominance" is "C-N NF acres" divided by "Chequamegon-Nicolet total ownership"; these percentages do add to 100, within rounding error. All values are approximate. See also Chequamegon-Nicolet Figure 3.

Subsection	Total subsection acres	C-N NF acres[†]	Additional NF acres[†] (HNF, ONF)	Prominence Percentage of subsection on NF lands	Dominance Percentage of C-N NF land in the subsection
212Jl*--Brule & Paint Rivers, Drumlinized Ground Moraine	1,521,490	538,310	110,992	35 (43)	35
212Jc*--Winegar Moraines	2,777,095	422,497	421,133	15 (30)	28
212Jj--Green Bay Lobe Stagnation Moraine	1,131,211	153,629	--	14	10
212Je--Central /Northwest Wisconsin Loess Plain	2,050,506	153,897	--	8	10
212Jf--Perkinstown End Moraine	969,147	67,941	--	7	4
212Ka--Bayfield Sand Plains	1,200,165	83,311	--	6.9	5
212Jb*--Gogebic/Penokee Iron Range	970,789	33,997	235,072	4 (28)	2
212Jm*--Northern Highlands Pitted Outwash	1,293,058	30,782	10,244	2 (3)	2
212Ja*--Lake Superior Clay Plain	1,326,484	12,864	52,292	1 (5)	1
212Hb**--West Green Bay Till Plain	2,671,452	23,585	29,931	0.9 (2)	2
212Jk--Spread Eagle/Dunbar Barrens	1,195,650	252[§]	--	0.02	0.02
Chequamegon-Nicolet total ownership:		1,521,065			

[†] These values were estimated by taking the proclamation acres for each subsection (from GIS analysis) and multiplying by the fraction of ownership to proclamation acres for the entire NF (75% for Cheq.-Nic.). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available.

[§] Dave Hoppe of the Nicolet, in a February 1996 internal draft, reported this value to be 40,000 acres. The large discrepancy may be due, at least in part, to differences in subsection delineations on the Nicolet map and the national (Eastern U.S., Keys *et al.* 1995) map used in our calculations.

* The Ottawa NF also occurs in this subsection.

** The Hiawatha NF also occurs in this subsection.

Chequamegon-Nicolet Table 5. Subsections of the Chequamegon-Nicolet National Forest (NF), alliances reported on NF land in these subsections, and representation by RNAs and RNA-equivalents.

Chequamegon-Nicolet Table 5. Subsections of the Chequamegon-Nicolet National Forest (NF), alliances reported on NF land in these subsections, and representation by RNAs and RNA-equivalents.Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. Alliances which occur in a subsection on Hiawatha or Ottawa land but not on Chequamegon-Nicolet land are included in this table but are not the responsibility of the Chequamegon-Nicolet NF (see Chequamegon-Nicolet Appendix C). The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) BPR= Brule and Paint Rivers, Drumlinized Ground Moraine, WM= Winegar Moraines, GBL= Green Bay Lobe Stagnation Moraine, BSP= Bayfield Sand Plains, NHO=Northern Highlands Pitted Outwash, PEM= Perkinstown End Moraine, SED= Spread Eagle/Dunbar Barrens, CNW= Central/Northwest Wisconsin Loess Plain, WGB= West Green Bay Till Plain, GPI= Gogebic/Penokee Iron Range, LSC= Lake Superior Clay Plain. For a list of alliances occurring in subsections of the Chequamegon-Nicolet NF but not reported on NF land, see Chequamegon-Nicolet Appendix A. For alliance nomenclature, see

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

--Subsections of Chequamegon-Nicolet NF--

Community Pattern **Alliances Reported on NF Land**		212JI* (BPR)		212Jc* (WM)		212Jj (GBL)		212Je (CNW)		212Jf (PEM)		212Ka (BSP)		212Jb* (GPI)		212Jm* (NHO)		212Ja* (LSC)		212Hb** (WGB)		212Jk (SED)	
Matrix Alliances	**Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance		▪		1 ▪		(1) ▪		(1) ▪		▪				▪		2 ▪		▪		▪	1		▫
Eastern Hemlock Forest Alliance		1 ▪		(1) ▪	(1)	▪		(1) ▪		▪				▪		(2) ▪	(1)	▪		▪	1		
Eastern White Pine - Eastern Hemlock Forest Alliance		▪	(1)	▪		▪		▪		▪				▪		▪	(1)	▪		▪			
Jack Pine Forest Alliance		▪		▪		▪						▪	1			▪		▪		▪			
Red Pine Forest Alliance		▪		▪		▪		▫		▪		▪	(1)	▪		(2) ▪	(2)	▪		▪			

* This subsection is shared with the Ottawa National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

** This subsection is shared with the Hiawatha National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

--Subsections of Chequamegon-Nicolet NF--

Community Pattern **Alliances Reported on NF Land**	212JI* (BPR)	212Jc* (WM)	212Jj (GBL)	212Je (CNW)	212Jf (PEM)	212Ka (BSP)	212Jb* (GPI)	212Jm* (NHO)	212Ja* (LSC)	212Hb** (WGB)	212Jk (SED)
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	▪	▪				▪	▪	▪	▪	▪	▪
White Pine Forest Alliance	▪	▪	▪	▪	▫	▪	▪	(1) ▪ (1)	▪	▪	
White Spruce - Balsam Fir - Aspen Forest Alliance	1 ▪	▪	▪				▪	▪	(1) ▪		
White Spruce - Balsam Fir Forest Alliance	▪	▪					▪		▪	▪	▪
Sugar Maple - American Basswood - (Red Oak) Forest Alliance	▪	▪		▪	▪		▪	▪	▪		
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	1 2 ▪	1 ▪ (1)	(1) ▪	▪	▪		1 ▪	1 ▪	▪	1 ▪	
Quaking Aspen - Paper Birch Forest Alliance	1 1 ▪	1 ▪	▪	▪	▪	1 ▪	▪	1 (1) ▪	▪	▪	▪
Jack Pine - (Red Pine) Wooded Herbaceous Alliance	▫	▪	▫			1 (1) ▪ (1)	▫	(1) ▪	▪	▪	▪

Large Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Jack Pine - Oak (Northern Pin, Black) Forest Alliance	▪		▪		▪						▪		▫		▪		▪		▪			
Northern White Cedar Forest Alliance	▪		▪										▪		▪		▪		▪			
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	▪		▪	1	▪				▪		▪		▪		▪ (2)		▪		▪			
Black Oak - Northern Pin Oak Forest Alliance	▪				▪						▪				▪		▪		▪			
Red Oak - Sugar Maple - (White Oak) Forest Alliance	1 ▪		▪		▪				▫				▪				▪					
Sugar Maple - White Ash - American Basswood Forest Alliance	▪		▪										▪				▪					
Quaking Aspen Forest Alliance	▪		▪		▪		▪		▪		▪	1	▪		▪		▪		▪		▪	

* This subsection is shared with the Ottawa National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

** This subsection is shared with the Hiawatha National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

--Subsections of Chequamegon-Nicolet NF--

Community Pattern **Alliances Reported on NF Land**	212JI* (BPR)	212Jc* (WM)	212Jj (GBL)	212Je (CNW)	212Jf (PEM)	212Ka (BSP)	212Jb* (GPI)	212Jm* (NHO)	212Ja* (LSC)	212Hb** (WGB)	212Jk (SED)
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	▪	▪					▪	▪	▪	▫	
Silver Maple Temporarily Flooded Forest Alliance	▪	▪	(1) ▪	▪	▪	(1) ▪	▪	▪	▪	▪	
Black Spruce - Tamarack Saturated Forest Alliance	▪							▪			
Black Spruce Saturated Forest Alliance	1 ▪ 1	1 ▪	▪	▪	▪	▪	▪	1 (2) ▪ (1)	▪	▪	▪
Northern White Cedar - Red Maple Saturated Forest Alliance	▪	▪					▪		▪	▪	▪
Northern White Cedar Saturated Forest Alliance	▪	1 (1) ▪	(1) ▪	▪	▪	▪	▪	▪ (1)	(1) ▪	1 ▪	(1) ▪
Black Ash - Red Maple Saturated Forest Alliance	1 ▪	1 ▪	▪	▪	▪	(3) ▪ (1)	1 ▪	▪	(1) ▪	▪	▪
Tamarack Saturated Forest Alliance	▪	1 ▪	▪	▪	1 ▪	▪	▪	1 ▪	▪	▪	▪
Black Spruce Saturated Woodland Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	
White Pine - Oak (White, Red) Wooded Herbaceous Alliance	▪	▪	▪				▪			▪	▪
Speckled Alder Seasonally Flooded Shrubland Alliance	▪	1 (2) ▪	(1) ▪ (1)	▪	▪	(3) ▪ (1)	▪	(2) ▪ (2)	(3) ▪	▪	▪
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance									▪	▪	
Leatherleaf Saturated Dwarf-Shrubland Alliance	(1) ▪	▪	(4) ▪	(2) ▪ (1)	1 ▪	▪	▪	(3) ▪	(4) ▪	(1) ▪	▪
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance	▫	▪	▪	▫	▫	▫	▪	▫	▪	▫	▫
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▪	1 ▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪	▪	(1) ▪ (1)		▪	▪	▪	▪	▪	▪	▪

* This subsection is shared with the Ottawa National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

** This subsection is shared with the Hiawatha National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

--Subsections of Chequamegon-Nicolet NF--

Community Pattern **Alliances Reported on NF Land**	212JI* (BPR)	212Jc* (WM)	212Jj (GBL)	212Je (CNW)	212Jf (PEM)	212Ka (BSP)	212Jb* (GPI)	212Jm* (NHO)	212Ja* (LSC)	212Hb** (WGB)	212Jk (SED)
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	1 (2) ▪	▪	▪	▪	▪	▪	▪	(1) ▪	▪		
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
Rock Outcrop/Butte Sparse Vegetation			▫				▪	▪	▪	▫	

Small Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Red Maple - Green Ash Seasonally Flooded Forest Alliance								▪				▪						▪		
Trembling Aspen Temporarily Flooded Forest Alliance																▪				
Eastern Hemlock Saturated Forest Alliance	▪		▪					▪	▪				▪		▪			▪		
White Pine - (Red Maple) Saturated Forest Alliance	▪		▪										▪			▪	▪		▪	
(Jack Pine, Red Pine) Woodland Alliance		▫		▪		▪		▪	1	▪				▪		▪	▪			
Northern White-cedar Woodland Alliance	▪			▫									▫			▫				
Common Juniper Shrubland Alliance													▪			▪				
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		▪	1	▪		▪		▪		(1) ▪			▪	1 ▪		▪		▪ (1)		
Bog Birch - (Willow) Saturated Shrubland Alliance	▪		▪		▪					▫				▪		▪		▫		
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		▪	(1)	▪	(2)	▪ (2)		▫		▪	(1)	▪		(6) ▪	(1)	▪		▪		▪
Wild Rice Semipermanently Flooded Herbaceous Alliance	▪			▫									▫	(1) ▪		▪				
Wiregrass Sedge Saturated Herbaceous Alliance			(1)	▪										▪			(1)	▪		

* This subsection is shared with the Ottawa National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).
** This subsection is shared with the Hiawatha National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

Community Pattern **Alliances Reported on NF Land**	--Subsections of Chequamegon-Nicolet NF--										
	212Jl* (BPR)	212Jc* (WM)	212Jj (GBL)	212Je (CNW)	212Jf (PEM)	212Ka (BSP)	212Jb* (GPI)	212Jm* (NHO)	212Ja* (LSC)	212Hb** (WGB)	212Jk (SED)
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance	▪	▪	(1) ▪	▪	▪		▪	(1) ▪	▪		
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
Open Bluff/Cliff Sparse Vegetation	▪	▪	▪				▪		▪	▪	
Wet Cliff Sparse Vegetation	▪	▪	(1) ▪		(1) ▪		▪			▪	
Lowland Talus Sparse Vegetation			▪		(1) ▪		▪		▪		
Cobble/Gravel Shore Sparse Vegetation	▪	▪					▪		▪	▪	▪
Inland Strand Beach Sparse Vegetation	▪	▪				▪	▪	▪	▪	▪	▪
Sand Flats Temporarily Flooded Sparse Vegetation	▪	▪					▪		▪	▪	▪

* This subsection is shared with the Ottawa National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).
** This subsection is shared with the Hiawatha National Forest. Some shaded cells may not be ecosystems to represent for the Chequamegon-Nicolet (see Chequamegon-Nicolet Appendix D).

Chequamegon-Nicolet Table 6. RNAs and RNA-equivalents of the Chequamegon-Nicolet National Forest. Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec-tion	RNA (acres)	RNA-Equivalent (acres)	
		Wisconsin SNA or Michigan† Natural Area	TNC Preserve of WI or MI†
212Jl*	•Bose Lake RNA (81) •Grandma Lake Wetlands (495) •McCaslin Mountain (524)	•Atkins Lake •Bastille Lake§ •Brule River Cliffs§ •Fox Maple Woods •Giant White Pine Grove (235) •Glocke Lake •Scott Lake-Shelp Lake (272)§ •Snow Falls Creek§ •Wisconsin Slough§	
212Jc*	•McCarthy Lake & Cedars (363) •Spider Lake (94)	•Dunn Lake •Mary Lake •Moose Lake Hemlocks (40) •Totagatic Highlands Hemlocks	•Crab Lake Preserve (130)§ •Flambeau Pines and Boreal Forest (220)§ •Squaw Lake (67)†
212Jj		•Barney Creek§ •Bear Caves •Bogus Swamp •Dalles of the St. Croix River •Flora Spring Pond (160) •Interstate Lowland Forest •Jung Hemlock-Beech Forest (80) •Keller Whitcomb Creek Woods •Kissick Alkaline Bog Lake •Minito Lake •Mud Lake Bog •Myklebust Lake •New Hope Pines •Oxbow Rapids, Upper Wolf River •Plagge Woods (80) •Tranus Lake •Tula Lake	•Battle Creek Outlet Forest (313)§
212Je		•Flambeau River Hardwood Forest (360) •Gobler Lake (470) •Lake of the Pines Conifer-Hardwoods (156)	•Upper North Fork of the Flambeau River (51)§
212Jf	•Twin Lakes Bog (38)	•Blue Hills Felsenmeer (75)	
212Ka	•Moquah (640)	•Bois-Brule Conifer Bog •Brant Brook Pines and Hardwoods •Crex Sand Prairie (Barrens) (79) •Ekdall Wetlands •Kohler-Peet Barrens and Cedar Swamp •Lampson Moraine Pines (120) •Norway Point Bottomlands •Solon Springs Sharptail Barrens (240) •St. Croix Ash Swamp •Sterling Barrens •Upper Brule River	•Brule River (4,958)§

(cont.)

212Jb*	•Chequamegon Hardwoods (80)	•Fort Wilkins State Park Site (1)†§	
212Jm*	•Memorial Grove Hemlocks (64) •Tucker Lake Hemlocks (158)	•Aurora Lake (250) •Bass Lake Preserve •Bittersweet Lakes (498) •Black Tern Bog (26) •Day Lake •Escanaba Lake Hemlocks (130) •Finnerud Pine Forest (120) •Frog Lake and Pines •Goodyear Springs-East •High Lake Spruce-Balsam Forest (40) •Holmboe Conifer Forest (32) •Johnson Lake Barrens (105) •Moose Lake •Patterson Hemlocks •Pine-Oak Grove§ •Plum Lake Hemlock Forest (200) •Rice Lake-Thunder Lake Marsh (250) •Squirrel River Pines •Stone Lake Pines •Tomahawk River Pines •Trout Lake Conifer Swamp (25) •Turtle-Flambeau Flowage§ •Wind Pudding Lake	•Clifford F. Messinger Bass Lake Preserve (570)§
212Ja*		•Bark Bay Slough (113) •Bibon Swamp •Big Bay Sand Spit and Bog •Dwight's Point & Pokegama Wetlands§ •Lost Creek Bog •Porcupine Mountains (47,671)†§ •Port Wing Boreal Forest •Presque Isle River Scenic Site (1,465)†§ •Sajdak Springs •Union Springs Scenic Site (160)†§	•Chequamegon Point (40)§ •Kakagon Sloughs (81) •Squaw Bay (12)§
212Hb**	•Dukes (233)†	•Hortonville Bog •Mukwa Bottomland Forest •Poppy's Rock (20) •Shaky Lake •Tellock's Hill Woods (32)	
212Jk		•Dunbar Barrens (240) •Gene's Pond (921)†§ •Hagar Mountain§ •Marinette Co. Beech Forest (40) •Miscauno Cedar Swamp (635) •Shakey Lakes (1,520)†§ •Spread Eagle Barrens	

* The Ottawa National Forest also occurs in this subsection.

** The Hiawatha National Forest also occurs in this subsection.

§ We were unable to obtain community data for this area.

† Michigan

Chequamegon-Nicolet Table 7. Summary of subsection representation on the Chequamegon-Nicolet National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect.
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Jl. Brule & Paint Rivers, Drumlinized Ground Moraine	3	9	1,100	507	1,607 *<1%*
212Jc. Winegar Moraines	2	7	457	457	914 *<1%*
212Jj. Green Bay Lobe Stagnation Moraine		18		633	633 *<1%*
212Je. Central /Northwest Wisconsin Loess Plain		4		1,037	1,037 *<1%*
212Jf. Perkinstown End Moraine	1	1	38	75	113 *<1%*
212Ka. Bayfield Sand Plains	1	12	640	5,397	6,037 *<1%*
212Jb. Gogebic/Penokee Iron Range	1	1	80	1	81 *<1%*
212Jm. Northern Highlands Pitted Outwash	2	24	222	2,246	2,468 *<1%*
212Ja. Lake Superior Clay Plain		13		49,542	49,542 *<1%*
212Hb. West Green Bay Till Plain	1	5	233	52	285 *<1%*
212Jk. Spread Eagle/Dunbar Barrens		7		3,356	3,356 *<1%*
TOTAL	11	101	2,770	63,303	66,073 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq). Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land[§]	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212Jl. Brule & Paint Rivers, Drumlinized Ground Moraine	45	7 *16%*	2 *4%*	8 *18%*	2
212Jc. Winegar Moraines	39	8 *21%*	3 *8%*	9 *23%*	3
212Jj. Green Bay Lobe Stagnation Moraine	35		10 *29%*	10 *29%*	
212Je. Central /Northwest Wisconsin Loess Plain	23		2 *9%*	2 *9%*	
212Jf. Perkinstown End Moraine	25	1 *4%*		1 *4%*	1
212Ka. Bayfield Sand Plains	23	2 *9%*	4 *17%*	5 *22%*	4
212Jb. Gogebic/Penokee Iron Range	40	1 *3%*		1 *3%*	1
212Jm. Northern Highlands Pitted Outwash	33	3 *9%*	10 *30%*	12 *36%*	5
212Ja. Lake Superior Clay Plain	22		2 *9%*	2 *9%*	
212Hb. West Green Bay Till Plain	25	2 *8%*	1 *4%*	3 *12%*	3
212Jk. Spread Eagle/Dunbar Barrens	3		1 *33%*	1 *33%*	

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.

**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

§ This total includes alliances reported only on Ottawa or Hiawatha land in the subsection.

Chequamegon-Nicolet Table 8. Alliances of the Chequamegon-Nicolet National Forest arranged by community pattern and community distribution

COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	•Red Pine Forest •Jack Pine - (Red Pine) Wooded Herbaceous	•Jack Pine - Oak (Northern Pin, Black) Forest •Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland*	•(Jack Pine, Red Pine) Woodland •Common Juniper Shrubland* •Cobble/Gravel Shore Sparse Vegetation*
LIMITED	•Eastern White Pine - Eastern Hemlock Forest •White Pine Forest •Eastern Hemlock Forest •Eastern Hemlock - Yellow Birch Forest •White Pine - (Red Pine) - Quaking Aspen Forest	•Northern White Cedar Forest •Northern White Cedar Saturated Forest •Black Oak - Northern Pin Oak Forest •Black Ash - Red Maple Saturated Forest •White Pine - (White Aok, Red Oak, Black Oak) Forest •Northern White Cedar - Red Maple Saturated Forest* •White Pine - Oak (White, Red) Wooded Herbaceous	•Eastern Hemlock Saturated Forest •Trembling Aspen Temporarily Flooded Forest •White Pine - (Red Maple) Saturated Forest* •Northern White Cedar Woodland* •Wild Rice Semipermanently Flooded Herbaceous •Knotweed - Mixed Forbs Temporarily Flooded Herbaceous •Wet Cliff Sparse Vegetation •Inland Strand Beach Sparse Vegetation
WIDESPREAD	•Jack Pine Forest •White Spruce - Balsam Fir Forest •Sugar Maple - Yellow Birch - (American Beech) Forest •Quaking Aspen - Paper Birch Forest •White Spruce - Balsam Fir - Aspen Forest	•Black Spruce Saturated Forest •Tamarack Saturated Forest •Black Spruce - Tamarack Saturated Forest •Black Spruce Saturated Woodland •Speckled Alder Seasonally Flooded Shrubland •Leatherleaf Saturated Dwarf-Shrubland •Cattail species - (Bulrush speices, Rush species) Seasonally Flooded Herbaceous •Tussock Sedge Seasonally Flooded Herbaceous •Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous •Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous •Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous •Rock Outcrop/Butte Sparse Vegetation	•Red Osier Dogwood - Willow Seasonally Flooded Shrubland •Bog Birch - (Willow) Saturated Shrubland •Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous •Wiregrass Sedge Saturated Herbaceous •Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous •Open Bluff/Cliff Sparse Vegetation •Sand Flats Temporarily Flooded Sparse Vegetation*

(cont.)

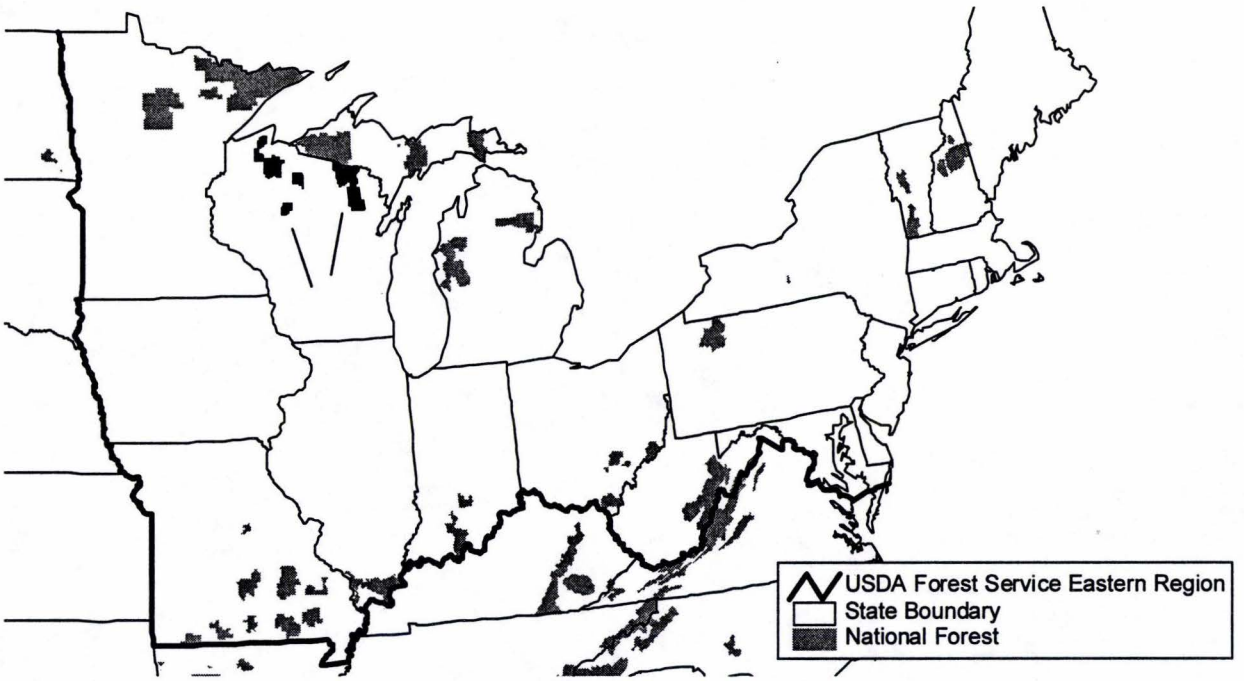
(cont. from previous page)

DISTRIBUTION	MATRIX	LARGE PATCH	SMALL PATCH
PERIPHERAL	•Sugar Maple - American Basswood - (Red Oak) Forest	•Red Oak - Sugar Maple - (White Oak) Forest •Sugar Maple - White Ash - American Basswood Forest* •Quaking Aspen Forest •Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest* •Silver Maple Temporarily Flooded Forest	•Red Maple - Green Ash Seasonally Flooded Forest •Lowland Talus Sparse Vegetation

*Not reported to occur on Chequamegon-Nicolet National Forest land, but reported to occur on Ottawa or Hiawatha National Forest land in one or more subsections shared with the Chequamegon-Nicolet. Should be checked for occurrence on Chequamegon-Nicolet land. See Chequamegon-Nicolet Appendix D.

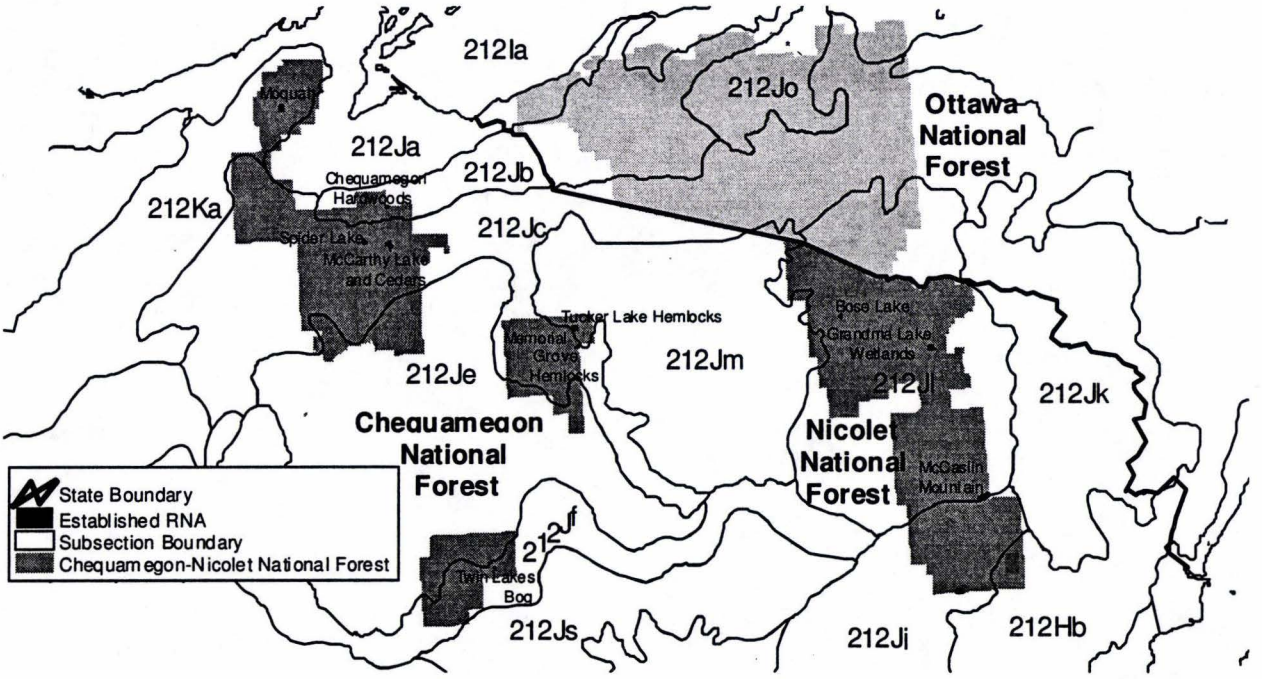
CHEQUAMEGON-NICOLET FIGURES

Chequamegon-Nicolet Figure 1. Location of the Chequamegon-Nicolet National Forest.



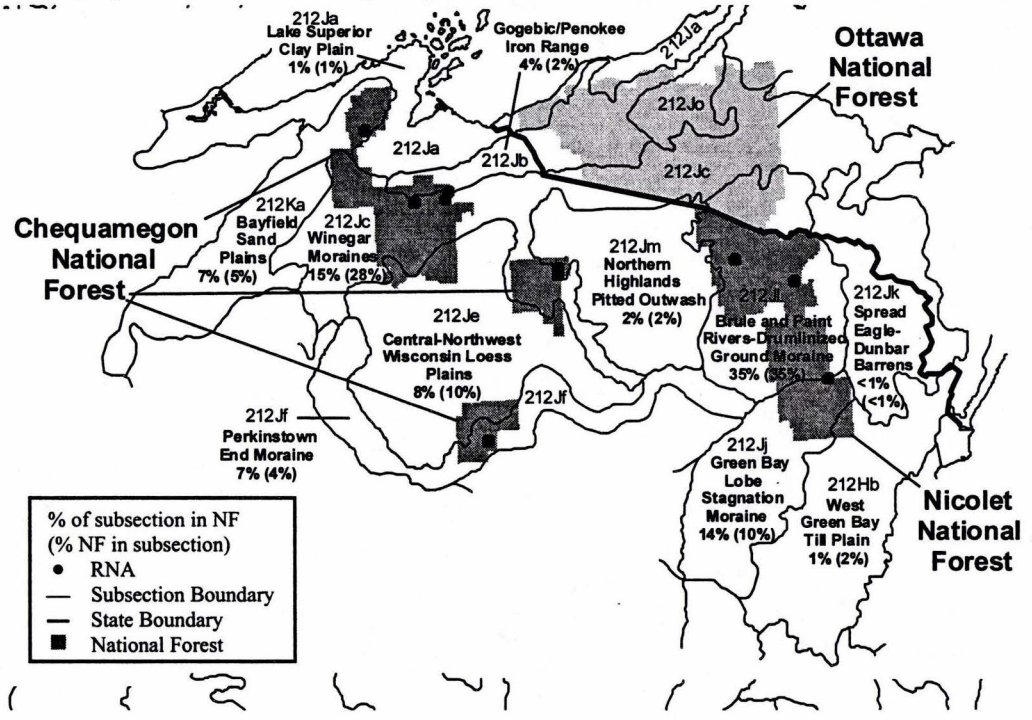
Chequamegon-Nicolet Figure 2. The Chequamegon-Nicolet National Forest with subsections and established RNAs.

A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the USFS.



Chequamegon-Nicolet Figure 3. Chequamegon-Nicolet National Forest with RNAs, RNA-equivalents, and relationship to subsections.

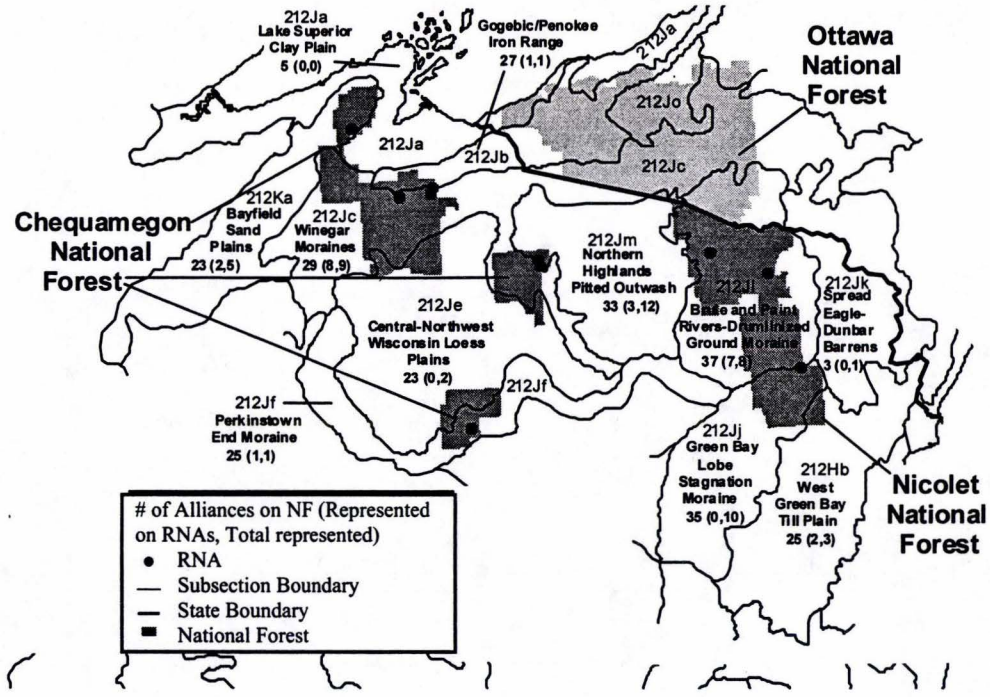
National forests are shaded, but not all land in the shaded area is managed by the national forests. In each subsection, the % of the subsection *managed* by the national forest (*prominence)* is shown, followed (in parentheses) by the % of land *managed* by the national forest in the subsection (*dominance*).



* In subsections shared by 2 National Forests, alliances found in the Ottawa or Hiawatha, but not in the Chequamegon-Nicolet, are not included in the total. Alliances can be represented in any of the National Forests, however.

Chequamegon-Nicolet Figure 4. Alliance representation on subsections of the Chequamegon-Nicolet National Forest.

National forests are shaded, but not all land in the shaded area is managed by the national forests. In each subsection is shown the number of alliances occurring on Chequamegon-Nicolet National Forest land*, and in parentheses, the number of these represented by RNAs followed by the total number represented.



* In subsections shared by 2 National Forests, alliances found in the Ottawa or Hiawatha, but not in the Chequamegon-Nicolet, are not included in the total. Alliances can be represented in any of the National Forests, however.

Chequamegon-Nicolet Appendix A. Subsections of the Chequamegon-Nicolet National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Chequamegon-Nicolet Table 5 for information on the format of this table. The difference between these two tables is that Chequamegon-Nicolet Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Chequamegon-Nicolet Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

--Subsections of Chequamegon-Nicolet NF--

Community Pattern **Alliances Not Reported on NF Land**	212JI* (BPR)		212Jc* (WM)		212Jj (GBL)		212Je (CNW)		212Jf (PEM)		212Ka (BSP)		212Jb* (GPI)		212Jm* (NHO)		212Ja* (LSC)		212Hb** (WGB)		212Jk (SED)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
White Oak - (Red Oak, Hickory species) Forest Alliance					▫						▫											
Black Oak - (Northern Pin Oak) Wooded Herbaceous Alliance											▪								▫			
Bur Oak - (White Oak) Wooded Herbaceous Alliance																					▪	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Northern White Cedar - Yellow Birch Forest Alliance													▪				▪					
Bur Oak - Oak (White, Northern Pin, Black) Woodland Alliance							▫		▫						▫							
American Beachgrass Herbaceous Alliance																	▪					
Little Bluestem - (Sand Dropseed) Herbaceous Alliance											(1) ▪											
Prairie Cordgrass Temporarily Flooded Herbaceous Alliance							▫		▫													
Prairie Dropseed - Spikerush Seasonally Flooded Herbaceous Alliance																			▪			
River Bulrush Seasonally Flooded Herbaceous Alliance																	▪					

Community Pattern **Alliances Not Reported on NF Land**	--Subsections of Chequamegon-Nicolet NF--										
	212Jl* (BPR)	212Jc* (WM)	212Jj (GBL)	212Je (CNW)	212Jf (PEM)	212Ka (BSP)	212Jb* (GPI)	212Jm* (NHO)	212Ja* (LSC)	212Hb** (WGB)	212Jk (SED)
Common Reed Semipermanently Flooded Herbaceous Alliance									▪		
Herbaceous Dunes Sparse Vegetation							▪		▪		
Northern White Cedar Complex									▪		
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous Alliance						▫					
Lake Sedge Seasonally Flooded Herbaceous Alliance	▪	▫	▫	▫	▪	▪	▫	▪	▪	▪	▫
Twig Rush Seasonally Flooded Herbaceous Alliance							▪		▪		
Clay Slopes Sparse Vegetation									▪		
Open Pavement Sparse Vegetation			▫				▪		▪	▪	
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation									▫		
Northern Sea Rocket Sparsely Vegetated Alliance									(3) ▪		

* The Ottawa National Forest also occurs in this subsection.
** The Hiawatha National Forest also occurs in this subsection.

Chequamegon-Nicolet Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Chequamegon-Nicolet National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Subsection 212JI. Brule and Paint Rivers-Drumlinized Ground Moraine						
Matrix Alliances						
Eastern Hemlock Forest Alliance	Bose Lake		25	D A B	B	
Eastern White Pine - Eastern Hemlock Forest Alliance		Giant White Pine Grove	30	D AB BC	BC	
White Spruce - Balsam Fir - Aspen Forest Alliance	Grandma Lake Wetlands		16	D AB B	BC	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Bose Lake		15	D AB B	BC	
	Grandma Lake Wetlands		100	C AB B	B	
	McCaslin Mountain		34	D AB B	BC	
Quaking Aspen - Paper Birch Forest Alliance	Bose Lake		37	D AB B	BC	
	Grandma Lake Wetlands		60	C AB B	B	
	McCaslin Mountain ?		191	C AB B	QB	?
Large Patch Alliances						
Red Oak - Sugar Maple - (White Oak) Forest Alliance	McCaslin Mountain		282	B AB B	B	
Black Spruce Saturated Forest Alliance	Bose Lake		4	D AB B	BC	
	Grandma Lake Wetlands		140	B AB B	B	
Black Ash - Red Maple Saturated Forest Alliance	McCaslin Mountain		9	C AB B	B	
White Pine - Oak (White, Red) Wooded Herbaceous Alliance	McCaslin Mountain ?		8	B AB B	QB	?
Leatherleaf Saturated Dwarf-Shrubland Alliance	Grandma Lake Wetlands ?		0		QI	?
		Atkins Lake	15	C AB BC	B	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	Grandma Lake Wetlands		135	B A B	B	
		Atkins Lake	10	B A BC	B	
		Glocke Lake	12	C A BC	B	
		Brule and Paint Rivers-Drumlinized Ground Moraine (212JI) Total:	1,123			
Subsection 212Jc. Winegar Moraines						
Matrix Alliances						
Eastern Hemlock - Yellow Birch Forest Alliance	McCarthy Lake & Cedars		14	C AB B	B	
Eastern Hemlock Forest Alliance		Moose Lake Hemlocks	23	D AB BC	BC	
		Totagatic Highlands Hemlocks	104	C A BC	B	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	McCarthy Lake & Cedars		13	D AB B	BC	
		Squaw Lake	67	C AB BC	BC	
Quaking Aspen - Paper Birch Forest Alliance	McCarthy Lake & Cedars		26	D AB B	BC	
Large Patch Alliances						

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	McCarthy Lake & Cedars		5	CD	AB	B	BC	
Black Spruce Saturated Forest Alliance	McCarthy Lake & Cedars		42	C	AB	B	B	
Northern White Cedar Saturated Forest Alliance	McCarthy Lake & Cedars		106	B	AB	B	B	
		Totagatic Highlands Hemlocks	43	C	A	BC	B	
Black Ash - Red Maple Saturated Forest Alliance	Spider Lake		94	B	AB	B	B	
Tamarack Saturated Forest Alliance	McCarthy Lake & Cedars		21	C	AB	B	B	
Speckled Alder Seasonally Flooded Shrubland Alliance	McCarthy Lake & Cedars		30	C	AB	B	B	
		Dunn Lake	130	B	AB	BC	B	
		Totagatic Highlands Hemlocks	13	C	AB	BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance	McCarthy Lake & Cedars		0				I	
Tussock Sedge Seasonally Flooded Herbaceous Alliance	McCarthy Lake & Cedars		40	C	AB	B	B	
Small Patch Alliances								
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	McCarthy Lake & Cedars		15	C	AB	B	B	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Dunn Lake	80	A	AB	BC	A	
		Winegar Moraines (212Jc) Total:	866					

Subsection 212Jj. *Green Bay Lobe Stagnation Moraine*

Shrubby Cinquefoil / Sedge Saturated Shrub Herbaceous Alliance		Myklebust Lake	2	C	AB	BC	B	
Matrix Alliances								
Eastern Hemlock - Yellow Birch Forest Alliance		Jung Hemlock-Beech Forest	63	C	AB	BC	B	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		Plagge Woods	80	C	AB	BC	B	
White Oak - (Red Oak, Hickory species) Forest Alliance		Dalles of the St. Croix River ?	24	C	AB	BC	QB	?
Large Patch Alliances								
Silver Maple Temporarily Flooded Forest Alliance		Interstate Lowland Forest	80	B	AB	BC	B	
Northern White Cedar Saturated Forest Alliance		Oxbow Rapids, Upper Wolf River	44	B	B	BC	B	
Black Ash - Red Maple Saturated Forest Alliance		Tranus Lake ?	3	D	B	BC	QC	?
Speckled Alder Seasonally Flooded Shrubland Alliance		Myklebust Lake	2	D	B	BC	C	
		Tranus Lake	34	C	AB	BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance		Bogus Swamp	660	A	AB	BC	AB	
		Jung Hemlock-Beech Forest	7	C	B	BC	B	
		Kissick Alkaline Bog Lake	20	C	AB	BC	B	
		Mud Lake Bog ?	30	C	AB	BC	QB	?
		Tula Lake	25	C	AB	BC	B	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Interstate Lowland Forest	10	C	AB	BC	B	
		Myklebust Lake	1	D	AB	BC	BC	

Community Pattern / Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Small Patch Alliances					
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Minito Lake	10	B AB BC	B
		Mud Lake Bog	5	C B BC	BC
		Myklebust Lake	3	C B BC	BC
		Tranus Lake	25	B AB BC	B
Wiregrass Sedge Saturated Herbaceous Alliance		Bogus Swamp	200	A AB BC	AB
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance		New Hope Pines	6	B AB BC	B
Wet Cliff Sparse Vegetation		Dalles of the St. Croix River	0	U AB BC	B
		Green Bay Lobe Stagnation Moraine (212Jj) Total:	1,334		

Subsection 212Je. *Central-Northwest Wisconsin Loess Plains*

Matrix Alliances					
Eastern Hemlock - Yellow Birch Forest Alliance		Flambeau River Hardwood Forest	349	C AB BC	B
Eastern Hemlock Forest Alliance		Lake of the Pines Conifer-Hardwoods	187	C A? BC	B
Large Patch Alliances					
Leatherleaf Saturated Dwarf-Shrubland Alliance		Flambeau River Hardwood Forest	8	C AB BC	B
		Gobler Lake	400	B AB BC	B
		Lake of the Pines Conifer-Hardwoods	3	D B BC	BC
		Central-Northwest Wisconsin Loess Plains (212Je) Total.	947		

Subsection 212Jf. *Perkinstown End Moraine*

Matrix Alliances					
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Twin Lakes Bog ?		8	D AB B	QBC ?
Large Patch Alliances					
Red Oak - Sugar Maple - (White Oak) Forest Alliance		Blue Hills Felsenmeer ?	65	B B BC	QB ?
Tamarack Saturated Forest Alliance	Twin Lakes Bog		25	C AB B	B
Leatherleaf Saturated Dwarf-Shrubland Alliance	Twin Lakes Bog		3	D AB B	BC
Small Patch Alliances					
Wet Cliff Sparse Vegetation		Blue Hills Felsenmeer	0	U AB BC	B
Lowland Talus Sparse Vegetation		Blue Hills Felsenmeer	10	B AB BC	B
		Perkinstown End Moraine (212Jf) Total:	111		

Subsection 212Ka. *Bayfield Sand Plains*

Matrix Alliances					
Jack Pine Forest Alliance	Moquah		114	C A B	BC
		Sterling Barrens ?	73	C AB BC	QB ?
Red Pine Forest Alliance		Lampson Moraine Pines	19	D BC BC	C
Quaking Aspen - Paper Birch Forest Alliance	Moquah		77	C AB B	BC
Jack Pine - (Red Pine) Wooded Herbaceous Alliance	Moquah		165	B A B	AB
		Kohler-Peet Barrens and Cedar Swamp	340	C A? BC	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Jack Pine - (Red Pine) Wooded Herbaceous Alliance		Sterling Barrens	20	D AB BC	BC
Trembling Aspen - Oak - Willow Shrubland Alliance	Moquah		70	B AB B	UM
		Crex Sand Prairie (Barrens) ?	79	B AB BC	QUM ?
		Solon Springs Sharptail Barrens	235	C AB BC	UM
Large Patch Alliances					
Quaking Aspen Forest Alliance	Moquah		89	C AB B	BC
Silver Maple Temporarily Flooded Forest Alliance		Brant Brook Pines and Hardwoods	71	B AB BC	B
Black Ash - Red Maple Saturated Forest Alliance		Ekdall Wetlands	45	C AB BC	B
		Lampson Moraine Pines	40	C B? BC	BC
		Norway Point Bottomlands	200	B ? BC	B
		St. Croix Ash Swamp	184	B AB BC	B
Speckled Alder Seasonally Flooded Shrubland Alliance		Bois-Brule Conifer Bog	12	C AB BC	B
		Ekdall Wetlands	35	C AB BC	B
		Sterling Barrens	45	C B BC	BC
		Upper Brule River	36	C AB BC	B
Little Bluestem - (Sand Dropseed) Herbaceous Alliance		Sterling Barrens	7	C AB BC	B
Bracken - Kalm's Brome Herbaceous Alliance	Moquah		23	C AB B	UM
Small Patch Alliances					
(Jack Pine, Red Pine) Woodland Alliance	Moquah		93	A AB B	AB
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Norway Point Bottomlands	90	A AB BC	B
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Norway Point Bottomlands	30	B B? BC	B
		Bayfield Sand Plains (212Ka) Total:	2,192		

Subsection 212Jb. *Gogebic-Penokee Iron Range*

Matrix Alliances					
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Chequamegon Hardwoods		75	C AB B	B
Large Patch Alliances					
Black Ash - Red Maple Saturated Forest Alliance	Chequamegon Hardwoods		5	CD AB B	BC
		Gogebic-Penokee Iron Range (212Jb) Total:	80		

Subsection 212Jm. *Northern Highlands Pitted Outwash*

Matrix Alliances					
Eastern Hemlock - Yellow Birch Forest Alliance	Memorial Grove Hemlocks		64	C AB B	B
	Tucker Lake Hemlocks		68	C AB B	B
Eastern Hemlock Forest Alliance		Escanaba Lake Hemlocks	25	D A BC	BC
		Patterson Hemlocks	410	C A BC	B
		Plum Lake Hemlock Forest	188	C A BC	B
Eastern White Pine - Eastern Hemlock Forest Alliance		Holmboe Conifer Forest	17	D AB BC	BC
Red Pine Forest Alliance		Finnerud Pine Forest	84	C A BC	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Red Pine Forest Alliance		Squirrel River Pines	41	D	B	BC	BC	
		Stone Lake Pines	15	D	A	BC	BC	
		Tomahawk River Pines	80	C	A	BC	B	
White Pine Forest Alliance		Frog Lake and Pines	150	C	AB	BC	B	
		High Lake Spruce-Balsam Forest	40	D	B	BC	BC	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Tucker Lake Hemlocks		21	D	AB	B	BC	
Quaking Aspen - Paper Birch Forest Alliance	Tucker Lake Hemlocks		39	D	AB	B	BC	
		Aurora Lake ?	33	D	B	BC	QBC	?
		Bittersweet Lakes	345	B	AB	BC	B	
Jack Pine - (Red Pine) Wooded Herbaceous Alliance		Johnson Lake Barrens	76	C	B	BC	B	
Large Patch Alliances								
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance		Holmboe Conifer Forest	5	D	B	BC	BC	
		Trout Lake Conifer Swamp	10	C	B	BC	BC	
Black Spruce Saturated Forest Alliance	Tucker Lake Hemlocks		12	C	AB	B	B	
		Aurora Lake	25	C	B	BC	B	
		Escanaba Lake Hemlocks	80	B	B	BC	B	
		Holmboe Conifer Forest	9	C	B	BC	BC	
Northern White Cedar Saturated Forest Alliance		Trout Lake Conifer Swamp	14	C	C	BC	BC	
Tamarack Saturated Forest Alliance	Tucker Lake Hemlocks		15	C	AB	B	B	
Speckled Alder Seasonally Flooded Shrubland Alliance		Holmboe Conifer Forest	1	D	B	BC	BC	
		Moose Lake	5	D	B	BC	BC	
		Rice Lake-Thunder Lake Marsh	40	C	AB	BC	B	
		Tomahawk River Pines	212	B	AB	BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance		Aurora Lake	98	B	B	BC	B	
		Finnerud Pine Forest	36	C	A	BC	B	
		Stone Lake Pines	50	B	A	BC	B	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Black Tern Bog	26	C	AB	BC	B	
Small Patch Alliances								
Eastern Hemlock Saturated Forest Alliance		Moose Lake ?	17	B	AB	BC	QB	?
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	Tucker Lake Hemlocks		3	D	AB	B	BC	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Bass Lake Preserve	70	A	B	BC	B	
		Goodyear Springs-East	135	A	AB	BC	B	
		Johnson Lake Barrens	31	B	AB	BC	B	
		Moose Lake	10	B	AB	BC	B	
		Rice Lake-Thunder Lake Marsh	92	A	AB	BC	B	
		Squirrel River Pines	20	B	AB	BC	B	
Wild Rice Semipermanently Flooded Herbaceous Alliance		Aurora Lake	94	A	AB	BC	B	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance		Patterson Hemlocks	10	B AB BC	B
		Northern Highlands Pitted Outwash (212Jm) Total:	2,816		

Subsection 212Ja. *Lake Superior Clay Plain*

Matrix Alliances

White Spruce - Balsam Fir - Aspen Forest Alliance		Port Wing Boreal Forest	100	C AB BC	B

Large Patch Alliances

Northern White Cedar Saturated Forest Alliance		Bibon Swamp	913	A AB BC	A
Black Ash - Red Maple Saturated Forest Alliance		Bibon Swamp	800	A AB BC	A
Speckled Alder Seasonally Flooded Shrubland Alliance		Bark Bay Slough	18	C AB BC	B
		Bibon Swamp	2,949	A AB BC	A
		Kakagon Sloughs	0		
		Port Wing Boreal Forest	26	C AB BC	B
Leatherleaf Saturated Dwarf-Shrubland Alliance		Bark Bay Slough	213	B AB BC	B
		Big Bay Sand Spit and Bog	306	B AB BC	B
		Kakagon Sloughs	0		
		Lost Creek Bog	150	B AB BC	B
		Port Wing Boreal Forest	37	C AB BC	B
American Beachgrass Herbaceous Alliance		Port Wing Boreal Forest ?	5	C AB BC	QBC ?
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Kakagon Sloughs	0		
Herbaceous Dunes Sparse Vegetation		Port Wing Boreal Forest ?	5	C AB BC	QBC ?

Small Patch Alliances

Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Bibon Swamp	913	A AB BC	A
		Kakagon Sloughs	0		
Northern Sea Rocket Sparsely Vegetated Alliance		Bark Bay Slough	23	B AB BC	B
		Big Bay Sand Spit and Bog	34	B AB BC	B
		Port Wing Boreal Forest	10	B AB BC	B
		Lake Superior Clay Plain (212Ja) Total:	6,502		

Subsection 212Hb. *West Green Bay Till Plain*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance	Dukes		32	D B B	C
Eastern Hemlock Forest Alliance	Dukes		5	D AB B	BC
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Dukes		94	C AB B	B
		Tellock's Hill Woods ?	54	C AB BC	QBC ?

Large Patch Alliances

Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		Mukwa Bottomland Forest ?	160	B AB BC	QB ?
Northern White Cedar Saturated Forest Alliance	Dukes		102	B B B	B
Leatherleaf Saturated Dwarf-Shrubland Alliance		Hortonville Bog	470	B AB BC	B

Small Patch Alliances

Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Shaky Lake	4	C B BC	BC

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Wiregrass Sedge Saturated Herbaceous Alliance		Shaky Lake	100	A AB BC	AB
		West Green Bay Till Plain (212Hb) Total:	1,021		

Subsection 212Jk. *Spread Eagle-Dunbar Barrens*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance		Marinette Co. Beech Forest ?	40	D AB BC	QBC ?
Trembling Aspen - Oak - Willow Shrubland Alliance		Dunbar Barrens	1,320	B AB BC	UM

Large Patch Alliances

Northern White Cedar Saturated Forest Alliance		Miscauno Cedar Swamp	392	B AB BC	B
Bracken - Kalm's Brome Herbaceous Alliance		Spread Eagle Barrens	4,167	A AB B	UM
		Spread Eagle-Dunbar Barrens (212Jk) Total:	5,919		
		Grand Total:	22,911		

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Chequamegon-Nicolet Appendix C. Unrepresented alliances (Forest-wide) on the Chequamegon-Nicolet National Forest

The following alliances are not represented in any of the subsections in which they occur on Chequamegon-Nicolet National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- Jack Pine Forest Alliance (matrix, widespread)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance (matrix, limited)
- Eastern White Pine - Eastern Hemlock Forest Alliance (matrix, limited)
- White Spruce - Balsam Fir - Aspen Forest Alliance (matrix, widespread)
- White Spruce - Balsam Fir Forest Alliance (matrix, widespread)
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance (matrix, peripheral)
- Northern White Cedar Forest Alliance (large patch, limited)
- Jack Pine - Oak (Northern Pin, Black) Forest Alliance (large patch, endemic)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (large patch, limited)
- Black Oak - Northern Pin Oak Forest Alliance (large patch, limited)
- Quaking Aspen Forest Alliance (large patch, peripheral)
- Silver Maple Temporarily Flooded Forest Alliance (large patch, peripheral)
- Black Spruce - Tamarack Saturated Forest Alliance (large patch, widespread)
- Black Spruce Saturated Woodland Alliance (large patch, widespread)
- White Pine - Oak (White, Red) Wooded Herbaceous Alliance (large patch, limited)
- Cattail species - (Bulrush species- Rush species) Seasonally Flooded Herbaceous Alliance (large patch, widespread)
- Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance (large patch, widespread)
- Rock Outcrop/Butte Sparse Vegetation (large patch, widespread)
- Red Maple - Green Ash Seasonally Flooded Forest Alliance (small patch, peripheral)
- Trembling Aspen Temporarily Flooded Forest Alliance (small patch, peripheral)
- Eastern Hemlock Saturated Forest Alliance (small patch, limited)
- Bog Birch - (Willow) Saturated Shrubland Alliance (small patch, widespread)
- Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance (small patch, widespread)
- Open Bluff/Cliff Sparse Vegetation (small patch, widespread)
- Lowland Talus Sparse Vegetation (small patch, peripheral)
- Inland Strand Beach Sparse Vegetation (small patch, limited)

Chequamegon-Nicolet Appendix D. Alliances reported on national forest land (Ottawa or Hiawatha National Forests) but not on Chequamegon-Nicolet National Forest land

Subsection	Alliance	Forest
212Hb	Eastern White Pine - Eastern Hemlock Forest Alliance	Hiawatha
	Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance*	Hiawatha
	Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	Hiawatha
212Ja	Eastern Hemlock Forest Alliance	Ottawa
	Eastern Hemlock - Yellow Birch Forest Alliance	Ottawa
	Red Pine Forest Alliance	Ottawa
	Eastern White Pine - Eastern Hemlock Forest Alliance	Ottawa
	White Spruce - Balsam Fir - Aspen Forest Alliance	Ottawa
	Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Ottawa
	Northern White Cedar Forest Alliance	Ottawa
	White Pine - (White Aok, Red Oak, Black Oak) Forest Alliance	Ottawa
	Red Oak - Sugar Maple - (White Oak) Forest Alliance	Ottawa
	Sugar Maple - White Ash - American Basswood Forest Alliance*	Ottawa
	Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance*	Ottawa
	Black Spruce Saturated Forest Alliance	Ottawa
	Black Ash - Red Maple Saturated Forest Alliance	Ottawa
	Black Spruce Saturated Woodland Alliance	Ottawa
	Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	Ottawa
	Cobble/Gravel Shore Sparse Vegetation*	Ottawa
	Sand Flats Temporarily Flooded Sparse Vegetation*	Ottawa
212Jb	Eastern Hemlock Forest Alliance	Ottawa
	Red Pine Forest Alliance	Ottawa
	White Pine - (Red Pine) - Quaking Aspen Forest Alliance	Ottawa
	White Pine Forest Alliance	Ottawa
	White Spruce - Balsam Fir - Aspen Forest Alliance	Ottawa
	White Spruce - Balsam Fir Forest Alliance	Ottawa
	White Pine - (White Aok, Red Oak, Black Oak) Forest Alliance	Ottawa
	Red Oak - Sugar Maple - (White Oak) Forest Alliance	Ottawa
	Sugar Maple - White Ash - American Basswood Forest Alliance*	Ottawa
	Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance*	Ottawa
	White Pine - (Red Maple) Saturated Forest Alliance*	Ottawa
	Common Juniper Shrubland Alliance*	Ottawa
	Sand Flats Temporarily Flooded Sparse Vegetation*	Ottawa

(cont.)

(cont. from previous page)

Subsection	Alliance	Forest
212Jc	Eastern Hemlock Forest Alliance	Ottawa
	Jack Pine Forest Alliance	Ottawa
	White Pine Forest Alliance	Ottawa
	White Spruce - Balsam Fir - Aspen Forest Alliance	Ottawa
	Northern White Cedar Forest Alliance	Ottawa
	Sugar Maple - White Ash - American Basswood Forest Alliance*	Ottawa
	Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance*	Ottawa
	Northern White Cedar - Red Maple Saturated Forest Alliance*	Ottawa
	White Pine - (Red Maple) Saturated Forest Alliance*	Ottawa
	Sand Flats Temporarily Flooded Sparse Vegetation*	Ottawa
212Jl	White Pine - (Red Pine) - Quaking Aspen Forest Alliance	Ottawa
	White Spruce - Balsam Fir Forest Alliance	Ottawa
	Sugar Maple - White Ash - American Basswood Forest Alliance*	Ottawa
	Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance*	Ottawa
	Northern White Cedar - Red Maple Saturated Forest Alliance*	Ottawa
	White Pine - (Red Maple) Saturated Forest Alliance*	Ottawa
	Northern White Cedar WoodlandAlliance*	Ottawa
	Sand Flats Temporarily Flooded Sparse Vegetation*	Ottawa

* This alliance does not occur on Chequamegon-National Forest land in any subsection.

Chequamegon-Nicolet Appendix E. Potential RNA-equivalents from the Chequamegon National Forest Pilot Study

- These areas have not been evaluated for RNA-equivalency.
- An entire area or a definable portion of an area may be determined to be an RNA-equivalent.

Chequamegon-Nicolet National Forest Wilderness & Special Areas

Identified in the Chequamegon pilot as potential RNA-equivalents.

Name	Subsection	Acres
Morgan Falls	212Jb	64
Rainbow Lake Wilderness	212Jc	1,200
Chippewa Pines	212Jc	17
Ghost Lake	212Jc	26
Goblin Woods	212Jc	10
Hay Lake	212Jc	37
Spillerberg	212Jc	30
Springbrook Meadows	212Je	70
Moquah Wildlife Area	212Ka	8,000

IX. C. Chippewa National Forest RNA Assessment

CHIPPEWA SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Chippewa National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Chippewa National Forest land. The Chippewa occupies portions of 4 subsections. Forty alliances occur on Chippewa National Forest lands, with the number of alliances in each subsection ranging from 26 to 36. There are 135 alliance-subsection combinations on Chippewa National Forest lands; these are the ecosystems to represent for the Chippewa National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Seven of the Chippewa alliance-subsection combinations (ecosystems) are represented by the 4 currently established Chippewa RNAs.

Existing **RNA-equivalents** in these subsections include:

- 23 Minnesota Scientific and Natural Areas and
- 2 preserves of The Nature Conservancy.

These 25 RNA-equivalents, along with the 4 RNAs, currently represent 31 (23%) of the 135 Chippewa alliance-subsection combinations (ecosystems).

UNREPRESENTED ECOSYSTEMS

The Chippewa National Forest has 104 ecosystems that are unrepresentated by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Chippewa National Forest are:

- Chippewa Plains (212Na)
- St. Louis Moraines (212Nb)

The Chippewa has high prominence (> 10%) in these subsections, and fewer than 25% of the alliances are represented in each.

The Pine Moraine and Outwash Plains (212Nc) is a **medium-priority subsection** because its prominence is 2% in the Chippewa, and 31% of the subsection's alliances are represented.

The Agassiz Lowlands (212Mb) is a **low-priority subsection** because its prominence is less than 1% in the Chippewa, and 31% of the subsection's alliances are represented. This subsection should be evaluated for special land type or other ecological features before deciding if little or no representation should occur.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), there are 10 **high-priority alliances** (of the 40 Chippewa alliances). These may be high-priority in each subsection in which they occur. Five are not represented in *any* of the subsections in which they occur on the Chippewa National Forest:

- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

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IX.C.1. INTRODUCTION

The Chippewa National Forest is located in north-central Minnesota (Chippewa Figure 1). Its proclamation boundaries contain 1,599,660 acres; 671,860 acres (42%) of this land is currently (FY97) managed by the Chippewa National Forest.

IX.C.2. METHODS

See the Methods of the assessment for a more detailed description of methods. The following section describes methods specific to the Chippewa National Forest.

IX.C.2.a. Subsections

To list the subsections occurring on each national forest, we overlaid a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo) on the digital subsection map of Keys *et al.* (1995). We also used these digital maps to determine the amount of land in each subsection within Chippewa proclamation boundaries. Using a national forest paper map we made a rough estimate of the percent of actual ownership within proclamation boundaries in each subsection (these values ranged from 30 - 60%). From the proclamation and ownership values we calculated the percentage of national forest land (ownership) in each subsection, and the percentage of each subsection with national forest land (ownership).

The percentage of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence. The percentage of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.C.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Minnesota, we first compiled the natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated to associations (one level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because only a subset of community occurrences are documented in the Heritage database, we sent the community lists to state Heritage and national forest ecologists, who added additional associations and alliances to each subsection list and provided additional information about the presence of alliances on national forest land. (The alliances that occur on Forest Service lands are the focus of the RNA assessment.)

IX.C.2.c. Identifying RNA-equivalents

RNA-equivalents were identified in discussions of ecologists of the USDA Forest Service, the Minnesota Department of Natural Resources, and the authors. The RNA Committee of the Chippewa National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.C.2.d. Digitizing RNAs and RNA-equivalents

The Chippewa National Forest provided us with a digitized map (1:24,000) of established and proposed RNA boundaries. Readers can request this cover from the Chippewa National Forest GIS coordinator (see Chippewa Figure 2. for established RNAs portion). Contact the Regional RNA Coordinator for a Lake States national forests RNA cover.

The Minnesota Natural Heritage Program provided us with a digital map of Minnesota Scientific and Natural Areas. The Minnesota Field Office of The Nature Conservancy (TNC) provided us with the central latitude and longitude for TNC preserves, which allowed us to create a digital point layer.

IX.C.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All Chippewa National Forest RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type. The cover types for Pine Point RNA (established in 1932) may be out of date.

Our sources for community occurrences on Minnesota Scientific and Natural Areas were paper files from the Minnesota Scientific and Natural Areas Program and Element Occurrence data from the Minnesota Natural Heritage Program. Total acreage for each SNA came from Minnesota Department of Natural Resources (1995). Our results for peatland SNAs were reviewed by Norm Aaseng of the Minnesota County Biological Survey. Questions remain on several of the other SNAs (Chippewa Appendix B).

We identified community occurrences on TNC preserves using paper files of The Nature Conservancy Minnesota Field Office. Questions remain on both preserves (Chippewa Appendix A).

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not provide representation. Instead it is listed with a question mark in Chippewa Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Chippewa National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.C.3. RESULTS

IX.C.3.a. Subsections on national forest land

The 4 subsections, which occur on Chippewa National Forest land, are (see also Chippewa Table 4):

- Chippewa Plains (212Na)
- St. Louis Moraines (212Nb)
- Pine Moraine and Outwash Plains (212Nc)
- Agassiz Lowlands (212Mb)

The Chippewa National Forest occurs primarily (about 63%) on the Chippewa Plains (**212Na**, Chippewa Table 4, Chippewa Figure 1). This is also the subsection, which contain the most national forest land: approximately 20% of Subsection 212Na is owned by the Chippewa National Forest.

The Chippewa National Forest also occupies a substantial portion of the St. Louis Moraines (**212Nb**) and Pine Moraine and Outwash Plains (**212Nc**). It manages 13% of Subsection 212Nb and 2% of Subsection 212Nc. Subsection 212Nb comprises 22% of national forest total ownership, and 212Nc comprises 12%.

Using current (1995) subsection boundaries, less than 1% of Subsection **212Mb** is managed by the Chippewa National Forest. However because the northern boundary is politically (U.S. - Canadian border) rather than ecologically drawn, the subsection is likely larger and therefore the percentage is likely even smaller. The subsection occupies about 3% of Chippewa National Forest land.

The percent of a subsection managed by the Forest Service gives an indication of the *prominence* of land coverage by the Forest in the subsection. In this report, subsections are listed in order of prominence (Chippewa Table 4).

IX.C.3.b. Natural communities in subsections

A total of 57 alliances are reported to occur in these 4 subsections. Of these, 40 are known to be on national forest land (Chippewa Table 5, first column); the 17 alliances not reported to occur on national forest land are listed in Chippewa Appendix A.

Of the 40 alliances occurring on the Chippewa National Forest, 10 are **matrix** alliances (see first set of alliances), 18 are **large patch** (second set) and 12 are **small patch** (third set). (See "National Vegetation Classification" in Overview.) The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on national forest land within each subsection:

- 212Na (Chippewa Plains): 36 alliances (10 matrix, 15 large patch, 11 small patch)
- 212Nb (St. Louis Moraines): 37 alliances (9 matrix, 17 large patch, 11 small patch)
- 212Nc (Pine Moraine and Outwash Plains): 36 alliances (10 matrix, 14 large patch, 11 small patch)
- 212Mb (Agassiz Lowlands): 26 alliances (3 matrix, 14 large patch, 9 small patch)

Chippewa Table 5 shows the alliances that occur in each subsection. There are thus a total of 135 subsection-alliance combinations.

IX.C.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Chippewa Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Chippewa Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

There are 4 established RNAs (Chippewa Table 6) and 1 nearly-established candidate RNA (cRNA) on the Chippewa National Forest. Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs on the Chippewa National Forest (Chippewa Figure 2) and proposed RNAs is available from the Chippewa National Forest GIS coordinator. For a Lake States national forests RNA cover, contact the Regional RNA Coordinator.

RNA-equivalents

Designations that are RNA-equivalents for the Chippewa National Forest are (Chippewa Table 2):

- all Minnesota Scientific and Natural Areas (SNAs) and
- all preserves of The Nature Conservancy (TNC), and

Twenty-five State Natural Areas (SNAs) and 2 TNC preserves serve as RNA-equivalents for the Chippewa National Forest (Chippewa Table 6).

The RNA Committee of the Chippewa National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency (Chippewa Table 3).

Subsection 212Na (Chippewa Plains)

Subsection 212Na contains 2 RNAs, together covering 733 acres (Chippewa Tables 6, 7a, Chippewa Figure 3):

- Battle Point
- Stony Point

RNA-equivalent protection covers 1,704 acres of the subsection on 3 SNAs (Chippewa Table 7a):

- Hole-In-the-Bog Peatland SNA
- Lost 40 SNA
- Pennington Bog SNA

The total representation is 0.1 % of the subsection (Chippewa Table 7a).

Natural communities (alliances)

Of 36 alliances reported to be on national forest land in 212La, 9 are represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Chippewa Table 5, column 212La; Chippewa Table 7b; Chippewa Figure 4).

Most of the represented alliances are **large patch**; 7 of the 15 large patch alliances are represented. Of 10 **matrix** alliances only 1 is represented, and of 11 **small patch** alliances only 1 is represented:

- Quaking Aspen - Paper Birch Forest Alliance (matrix)
- Inland Strand Beach Sparse Vegetation (small patch)

An additional 4 matrix alliances have a low-quality (BC-ranked) occurrence on an RNA or RNA-equivalent:

- Red Pine Forest Alliance (Battle Point RNA and Lost 40 SNA)
- White Spruce - Balsam Fir - Aspen Forest Alliance (Pennington Bog SNA)
- White Spruce - Balsam Fir Forest Alliance (Lost 40 SNA)
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance (Battle Point RNA)

A BC-rank was given to these occurrences due to their small size (Chippewa Appendix B).

Subsection 212Nb (St. Louis Moraines)

Subsection 212Nb contains 1 RNA of 79 acres (Chippewa Table 7, 7a, Chippewa Figure 3):

- Clustered Bur Reed RNA

The 3 SNAs cover 271 acres of the subsection (Chippewa Table 7a):

- Botany Bog SNA
- Ladies Tresses Swamp SNA
- Wabu Woods SNA

The total representation is 0.03 % of the subsection (Chippewa Table 7a).

Natural communities (alliances)

Of the 37 alliances reported to be on Forest land in 212Nb, 3 are represented by high-quality occurrences (Chippewa Table 5, column 212Lb; Chippewa Table 7b; Chippewa Figure 4).

The 3 represented alliances are all **large patch**:

- Northern White Cedar Saturated Forest Alliance
- Black Ash - Red Maple Saturated Forest Alliance
- Leatherleaf Saturated Dwarf-Shrubland Alliance

Thus of 17 **large patch** alliances, 3 are represented). None of the 9 **matrix** alliances and 11 **small patch** alliances are represented.

An additional 3 matrix alliances and 3 large-patch alliances have a low-quality (BC-ranked) occurrence on an RNA or RNA-equivalent:

- Red Pine Forest Alliance (matrix, Clustered Bur Reed RNA)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance (matrix, Wabu Woods SNA)
- Quaking Aspen - Paper Birch Forest Alliance (matrix, Clustered Bur Reed RNA)
- Paper Birch Forest Alliance (large patch, Clustered Bur Reed RNA)
- Black Spruce Saturated Forest Alliance (large patch, Clustered Bur Reed RNA)
- Speckled Alder Seasonally Flooded Shrubland Alliance (large patch, Botany Bog SNA)

A BC or C rank was given to these occurrences due to their small size (Chippewa Appendix B).

Subsection 212Nc (Pine Moraine and Outwash Plains)

Subsection 212Nc contains 1 RNA of 1,239 acres:

- Pine Point RNA

The 3 SNAs and 2 TNC preserves cover 4,408 acres:

- Greenwater Lake SNA (815)
- Iron Springs Bog SNA (215)
- Itasca Wilderness Sanctuary SNA (1,580)
- Lake Alexander Preserve (1,638)
- Paul Bunyan Savanna (160)

The total representation is 0.2% of the subsection (Chippewa Table 7a).

Natural communities (alliances)

Of the 36 alliances reported to be on Forest land in Subsection 212Nc, 11 are represented by a high-quality occurrence in at least one RNA or RNA-equivalent (Chippewa Table 5, column 212Nc; Chippewa Table 7b; Chippewa Figure 4). Community occurrences on Greenwater Lake and Iron Springs Bog SNAs are not included because we were unable to find good community information for these SNAs (Chippewa Appendix B).

Of 10 **matrix** alliances, 5 are represented; of 15 **large patch** alliances, 5 are represented, and of 11 **small patch** alliances, 1 is represented.

One of the 10 unrepresented large patch alliances has a low-quality (BC-or C-ranked) occurrence on Paul Bunyan Savanna TNC Preserve:

- Jack Pine - Oak (Northern Pine, Black) Forest Alliance.

A BC-rank was given to this occurrence due to its small size (Chippewa Appendix B).

Subsection 212Mb (Agassiz Lowlands)

Subsection 212Mb contains no RNAs and 14 SNAs:

- Caldwell Brook Cedar Swamp SNA
- Gustafson's Camp SNA
- Lost River Peatland SNA
- Luxemberg Peatland SNA
- Mulligan Lake Peatland SNA
- Myrtle Lake Peatland SNA
- Norris Camp Peatland SNA
- North Black River Peatland SNA
- Pine & Curry Island SNA
- Pine Creek Peatland SNA
- Red Lake Peatland SNA
- South Black River Peatland SNA
- Sprague Creek Peatland SNA
- Winter Road Lake Peatland SNA

Together these SNAs cover 136,196 acres (3%) of the subsection (Chippewa Table 6, 9b, Chippewa Figure 3).

Natural communities (alliances)

Of the 26 alliances reported to occur on Forest land in Subsection 212Mb, 8 are represented by a high-quality occurrence in at least one RNA-equivalent (Chippewa Table 5, column 212Nc; Chippewa Table 7; Chippewa Figure 4).

Most of the represented alliances are large patch: 6 of 14 **large patch** alliances are represented. Of 9 **small patch** alliances, 2 are represented. None of the 3 **matrix** alliances are represented. (Matrix alliance White Pine - (Red Pine) - Quaking Aspen Forest has a B-ranked occurrence on an SNA, but the alliance is not reported to occur on national forest land.)

IX.C.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsection for the Chippewa National Forest. It also provides our suggested priority ranking of the subsections based on prominence and representation of biological variation (% alliances represented). Dominance, the percentage of national forest land and percentage of acres represented in each subsection was not used to prioritize the subsections, though the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Chippewa Table 5 by shaded cells that contain no number.

Subsection	Dominance Percentage of Chippewa NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Chippewa NF lands	Percentage of NF alliances represented	Proposed priority
212Na (Chippewa Plains)	63	0.1	20	25	high
212Nb (St. Louis Moraines)	22	.03	13	8	high
212Nc (Pine Moraine and Outwash Plains)	12	0.2	2	31	med.
212Mb (Agassiz Lowlands)	3	3	0.4	31	low

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Within this overall order, two or more subsections with the same proposed priority are listed in arbitrary order. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

The Chippewa Plains (**212Na**) is a priority to represent because it is the subsection with the highest prominence and only 25% of the alliances are represented. The Chippewa National Forest also has high prominence in the St. Louis Moraines (**212Nb**), and only 8% of alliances in this subsection are represented. The subsections with the most representation in terms of both alliances and acres, Pine Moraine and Outwash Plains (212Nc) and Agassiz Lowlands (212Mb), also have lower prominence to the Chippewa Forest. They are therefore lower priority. Pine Moraine and Outwash Plains is higher priority than Agassiz Lowlands because it has higher prominence.

Subsection 212Na (Chippewa Plains)

Of 36 alliances, 9 are represented, leaving 27 (75%) alliances in need of representation (Chippewa Figure 3). The Chippewa National Forest has highest prominence in this subsection, and it is probably the highest priority to represent.

Within the subsection, the matrix alliances may be first priority for RNA establishment. Only 1 of the matrix alliances is represented in this subsection. The 9 unrepresented matrix alliances are:

- Jack Pine Forest Alliance
- *Red Pine Forest Alliance (Battle Point RNA, Lost 40 SNA)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- *White Spruce - Balsam Fir - Aspen Forest Alliance (Pennington Bog SNA)
- *White Spruce - Balsam Fir Alliance (Lost 40 SNA)
- *Sugar Maple - American Basswood - (Red Oak) Forest Alliance (Battle Point RNA)
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- White Oak - (Red Oak, Hickory) Forest Alliance

The marked (*) alliances have a low-quality occurrence on the indicated RNA or RNA-equivalent. The quality/viability of these occurrences should be verified.

Subsection 212Nb (St. Louis Moraines)

Of 37 alliances, 3 are represented, leaving 34 alliances (92%) in need of representation (Chippewa Figure 3). The 3 represented alliances are all wetland types. Especially considering the Chippewa National Forest's prominence in this subsection, further representation of the biological variation in this subsection is very important.

None of the matrix alliances are represented in this subsection, and these may be of highest priority for RNA establishment:

- Jack Pine Forest Alliance
- *Red Pine Forest Alliance (*Clustered Bur Reed RNA*)
- *White Pine - (Red Pine) - Quaking Aspen Forest Alliance (*Wabu Woods SNA*)
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance (*might occur on Wabu Woods SNA*)
- White Spruce - Balsam Fir Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance (*might occur on Botany Bog SNA*)

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- *Quaking Aspen - Paper Birch Forest Alliance (*Clustered Bur Reed RNA; might also occur on Wabu Woods SNA*)

The marked (*) alliances have a low-quality occurrence on the indicated RNA or RNA-equivalent. The quality/viability of these occurrences should be verified.

Subsection 212Nc (Pine Moraine and Outwash Plains)

Of 36 alliances, 11 are represented, leaving 25 alliances (69%) in need of representation (Chippewa Figure 3).

Half of the matrix alliances are represented. The 5 unrepresented matrix alliances are:

- White Pine - (Red Pine) - Quaking Aspen Forest Alliance (*might occur on Greenwater Lake SNA*)
- White Pine Forest Alliance (*might occur on Itasca Wilderness Sanctuary SNA*)
- White Spruce - Balsam Fir Alliance
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance (*might occur on Itasca Wilderness Sanctuary SNA*)
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (*might occur on Lake Alexander Preserve or Paul Bunyan Savanna*)

All but 1 of these unrepresented matrix alliances have a questionable occurrence on an RNA-equivalent. If the questions are resolved and the ranks high enough, then these alliances will be represented.

Subsection 212Mb (Agassiz Lowlands)

Of 26 alliances, 8 are represented, leaving 18 alliances (69%) in need of representation (Chippewa Figure 3). The Chippewa National Forest has less prominence in this subsection, so unless special features are identified as important, the inadequate representation of this subsection may be of less concern to the Forest.

None of the matrix alliances are represented in this subsection, and these may be of highest priority for RNA establishment within the subsection:

- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

CHIPPEWA TABLES

Chippewa Table 1. Established research natural areas (RNAs) of the Chippewa National Forest

RNA	Acres	Subsection	Established
Battle Point RNA	329	212Na	1991
Clustered Bur Reed RNA	79	212Nb	1991
Pine Point RNA	1239	212Nc	1932
Stony Point RNA	404	212Na	1991

Chippewa Table 2. Designations identified to date as RNA-equivalents for the Chippewa National Forest

Protected area designation	Managed by
all Minnesota Scientific and Natural Areas (SNAs)	Minnesota Department of Natural Resources
all preserves of The Nature Conservancy (TNC)	The Nature Conservancy (private)

Chippewa Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Chippewa National Forest

The Chippewa National Forest may work with these organizations to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Special Areas, including additional Wilderness	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities (University of Minnesota, private)

Chippewa Table 4. Subsections of the Chippewa National Forest (NF), in order of prominence

"NF acres" is the number of acres of national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Chippewa National Forest total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Chippewa Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on Chippewa NF lands	Dominance Percentage of Chippewa NF in subsection
212Na—Chippewa Plains	2,086,398	423,450	20	63
212Nb—St. Louis Moraines	1,136,752	150,020	13	22
212Nc—Pine Moraine and Outwash Plains	3,593,133	79,590	2	12
212Mb—Agassiz Lowlands	4,288,423	18,800	0.4	3
Chippewa National Forest total ownership:		671,860		

Chippewa Table 5. Subsections and alliances reported on Chippewa National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Chippewa Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) CP= Chippewa Plains, SLM= St. Louis Moraines, PMO= Pine Moraine and Outwash Plains, AL= Agassiz Lowlands. For a list of alliances occurring in subsections of the Chippewa NF but not reported on NF land, see Chippewa Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Chippewa NF

Community Pattern **Alliances Reported on NF Land**	212Na (CP)		212Nb (SLM)		212Nc (PMO)		212Mb (AL)	
Matrix Alliances Rank:	AB	C	AB	C	AB	C	AB	C
Jack Pine Forest Alliance	▪		▪		(1) ▪	1	▪	
Red Pine Forest Alliance	▪ (1)	1	▪	1	(1) ▪	1	▪	
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	▪		▪ (1)		▪		(1) ▪	
White Pine Forest Alliance	▪		▪		▪		▪	
White Spruce - Balsam Fir - Aspen Forest Alliance	▪ (1)		▪		(1) ▪		▪	
White Spruce - Balsam Fir Forest Alliance	▪ (1)		▪		▪		▪	
Sugar Maple - American Basswood - (Red Oak) Forest Alliance	▪	1	▪		▪		▪	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	▪		▪		▪		▫	
White Oak - (Red Oak, Hickory species) Forest Alliance	▪		▫		(1) ▪		▫	
Quaking Aspen - Paper Birch Forest Alliance	1 ▪	1	▪	1	(2) ▪	1	▪	
Large Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C
Jack Pine - Oak (Northern Pin, Black) Forest Alliance	▪		▪		▪ (1)			
Northern White Cedar - Yellow Birch Forest Alliance	▫		▪		▪		▪	
Northern White Cedar Forest Alliance	▪		▪		▪		▪	
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	▪		▪		▪		▪	
Black Oak - Northern Pin Oak Forest Alliance	▪		▫		(1) ▪			

Subsections of Chippewa NF

Community Pattern **Alliances Reported on NF Land**	212Na (CP)	212Nb (SLM)	212Nc (PMO)	212Mb (AL)
Paper Birch Forest Alliance	▪	1 ▪	▪	▪
Silver Maple Temporarily Flooded Forest Alliance	▫	▪	▪	▪
Black Spruce Saturated Forest Alliance	(1) ▪	1 ▪	▪	(2) ▪
Northern White Cedar Saturated Forest Alliance	(1) ▪	(1) ▪ (1)	▪	(3) ▪
Black Ash - Red Maple Saturated Forest Alliance	1 ▪ (1)	(1) ▪	(1) ▪ (1)	▪
Tamarack Saturated Forest Alliance	▪	▪	(2) ▪	(4) ▪
Black Spruce Saturated Woodland Alliance	(1) ▪	▪	▪	(6) ▪
Speckled Alder Seasonally Flooded Shrubland Alliance	(1) ▪ (1)	▪ (1)	(3) ▪	▪
Leatherleaf Saturated Dwarf-Shrubland Alliance	(1) ▪	1 ▪ (1)	▪	(3) ▪
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance	▪	▪	▪	▪
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▪	▪	▪	▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	1 ▪	▪	(1) ▪	▪
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	▪	▪	▪	(9) ▪

Small Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C
Green Ash - (American Elm) Forest Alliance	▪		▪		▪		▪	
Trembling Aspen Temporarily Flooded Forest Alliance	▫		(1) ▪		▫		▪	
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	▪		▪		(1) ▪		▪	
Bog Birch - (Willow) Saturated Shrubland Alliance	▪		▪		▪		(2) ▪	
Lake Sedge Seasonally Flooded Herbaceous Alliance	▪		▪		▪		▪	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance	▪		▪		▪		▪	
Wild Rice Semipermanently Flooded Herbaceous Alliance	▪		▪		▪		▪	
Wiregrass Sedge Saturated Herbaceous Alliance	▪		▪		▪		(10) ▪	
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪		▪		▪		▪	
Cobble/Gravel Shore Sparse Vegetation	▪		▪		▪		▪	
Inland Strand Beach Sparse Vegetation	1 ▪		▪		▪		▪	
Sand Flats Temporarily Flooded Sparse Vegetation	▪		▪		▪		▪	

Chippewa Table 6. RNAs and RNA-equivalents of the Chippewa National Forest

Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA. No Forest Service RNA-equivalents have yet been identified for the Chippewa National Forest.

Subsec -tion	RNA (acres)	RNA-equivalent (acres)	
		SNA	TNC preserve
212Na	Battle Point RNA (329) Stony Point RNA (404)	Hole-In-the-Bog Peatland SNA (1,482) Lost 40 SNA (114) Pennington Bog SNA (108)	
212Nb	Clustered Bur Reed RNA (79)	Botany Bog SNA (127) Ladies Tresses Swamp SNA (40) Wabu Woods SNA (104)	
212Nc	Pine Point RNA (1,239)	Greenwater Lake SNA (815) Iron Springs Bog SNA (215) Itasca Wilderness Sanctuary SNA (1,580)	Lake Alexander Preserve (1,638) Paul Bunyan Savanna (160)
212Mb		Caldwell Brook Cedar Swamp SNA (80) Gustafson's Camp SNA (185) Lost River Peatland SNA (11,848) Luxemberg Peatland SNA (592) Mulligan Lake Peatland SNA (5,236) Myrtle Lake Peatland SNA (22,630) Norris Camp Peatland SNA (1,316) North Black River Peatland SNA (1,220) Pine & Curry Island SNA (81) Pine Creek Peatland SNA (944) Red Lake Peatland SNA (82,783) South Black River Peatland SNA (5,992) Sprague Creek Peatland SNA (820) Winter Road Lake Peatland SNA (2,469)	

Chippewa Table 7. Summary of subsection representation on the Chippewa National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Na. Chippewa Plains	2	3	733	1,704	2,437 *<1%*
212Nb. St. Louis Moraines	1	3	79	271	350 *<1%*
212Nc. Pine Moraine and Outwash Plains	1	5	1,239	4,408	5,647 *<1%*
212Mb. Agassiz Lowlands		14		136,196	136,196 *3%*
TOTAL	4	25	2,051	142,579	144,630 *1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212Na. Chippewa Plains	36	4 *11%*	5 *14%*	9 *25%*	4
212Nb. St. Louis Moraines	37	1 *3%*	2 *5%*	3 *8%*	6
212Nc. Pine Moraine and Outwash Plains	36	2 *6%*	11 *31%*	11 *31%*	1
212Mb. Agassiz Lowlands	26		8 *31%*	8 *31%*	

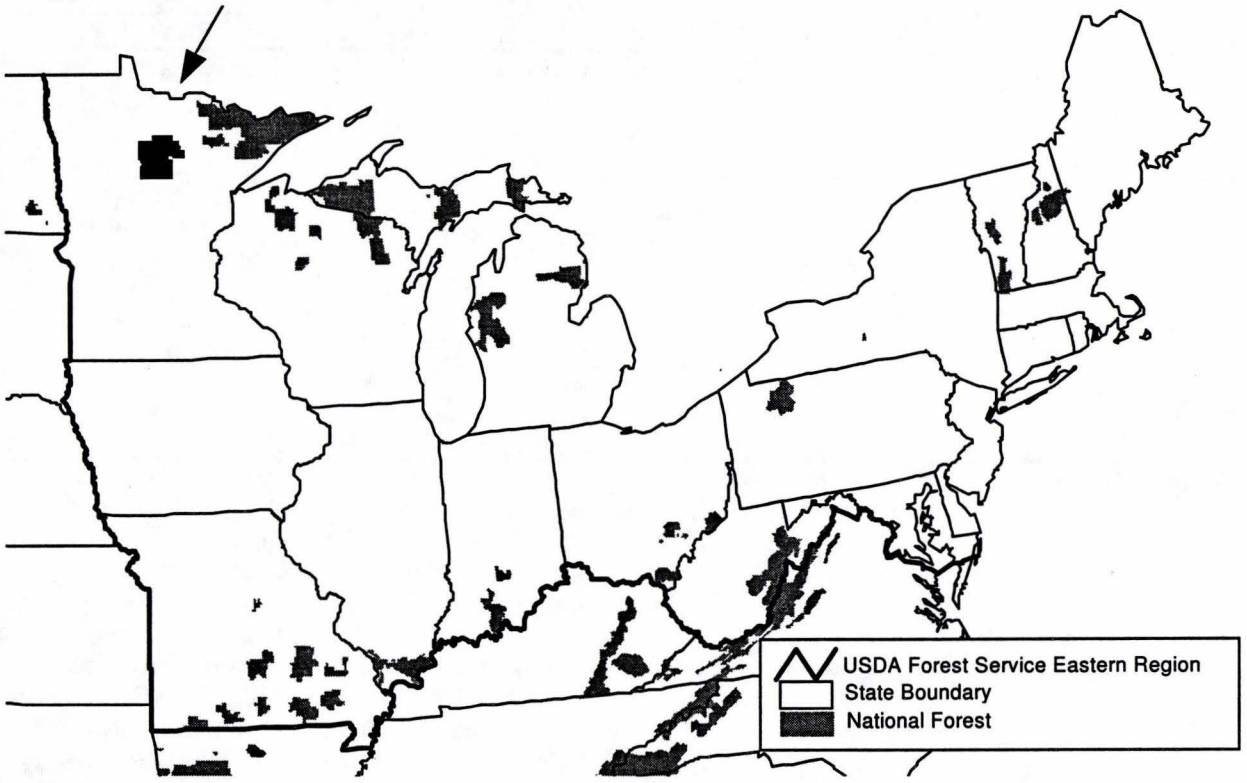
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Chippewa Table 8. Alliances of the Chippewa National Forest arranged by community pattern and community distribution

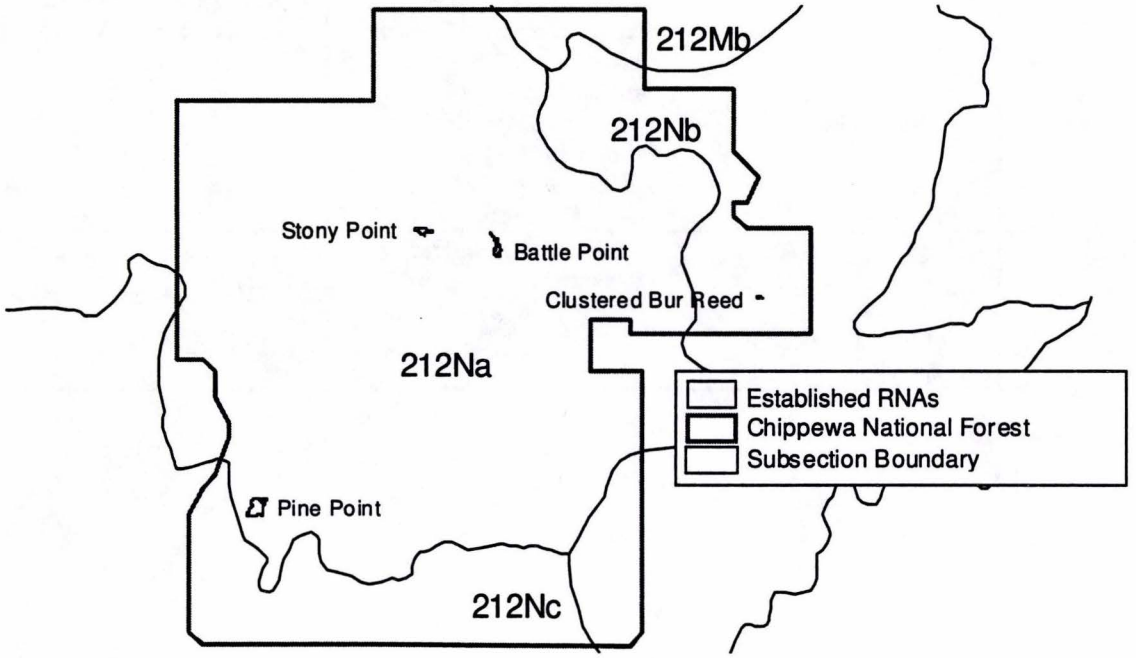
COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	• Red Pine Forest	• Northern White Cedar - Yellow Birch Forest • Jack Pine - Oak (Northern Pin, Black) Forest	• Cobble/Gravel Shore Sparse Vegetation
LIMITED	• White Pine Forest • White Pine - (Red Pine) - Quaking Aspen Forest	• Northern White Cedar Forest • Northern White Cedar Saturated Forest • Black Oak - Northern Pin Oak Forest • Black Ash - Red Maple Saturated Forest • White Pine - (White Oak, Red Oak, Black Oak) Forest	• Trembling Aspen Temporarily Flooded Forest • Wild Rice Semipermanently Flooded Herbaceous • Inland Strand Beach Sparse Vegetation
WIDESPREAD	• Jack Pine Forest • White Spruce - Balsam Fir Forest • Sugar Maple - Yellow Birch - (American Beech) Forest • Quaking Aspen - Paper Birch Forest • White Spruce - Balsam Fir - Aspen Forest	• Black Spruce Saturated Forest • Paper Birch Forest • Tamarack Saturated Forest • Black Spruce Saturated Woodland • Speckled Alder Seasonally Flooded Shrubland • Leatherleaf Saturated Dwarf-Shrubland • Cattail species - (Bulrush speices, Rush species) Seasonally Flooded Herbaceous • Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous • Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous • Tussock Sedge Seasonally Flooded Herbaceous	• Red Osier Dogwood - Willow Seasonally Flooded Shrubland • Bog Birch - (Willow) Saturated Shrubland • Lake Sedge Seasonally Flooded Herbaceous • Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous • Wiregrass Sedge Saturated Herbaceous • Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous • Sand Flats Temporarily Flooded Sparse Vegetation
PERIPHERAL	• Sugar Maple - Am. Basswood - (Red Oak) Forest • White Oak - (Red Oak, Hickory) Forest	• Silver Maple Temporarily Flooded Forest	• Green Ash - (American Elm) Forest

CHIPPEWA FIGURES

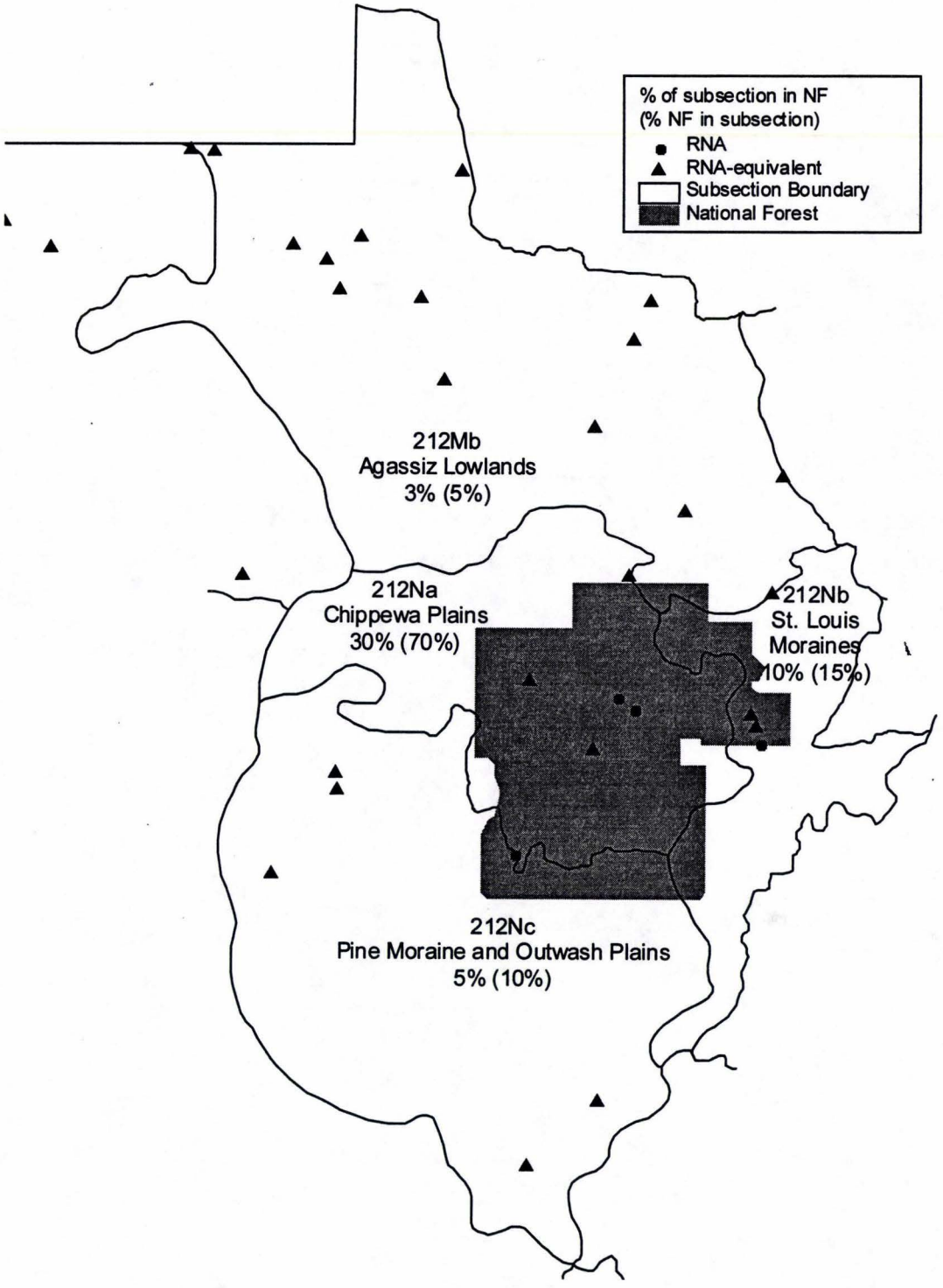
Chippewa Figure 1. Location of the Chippewa National Forest



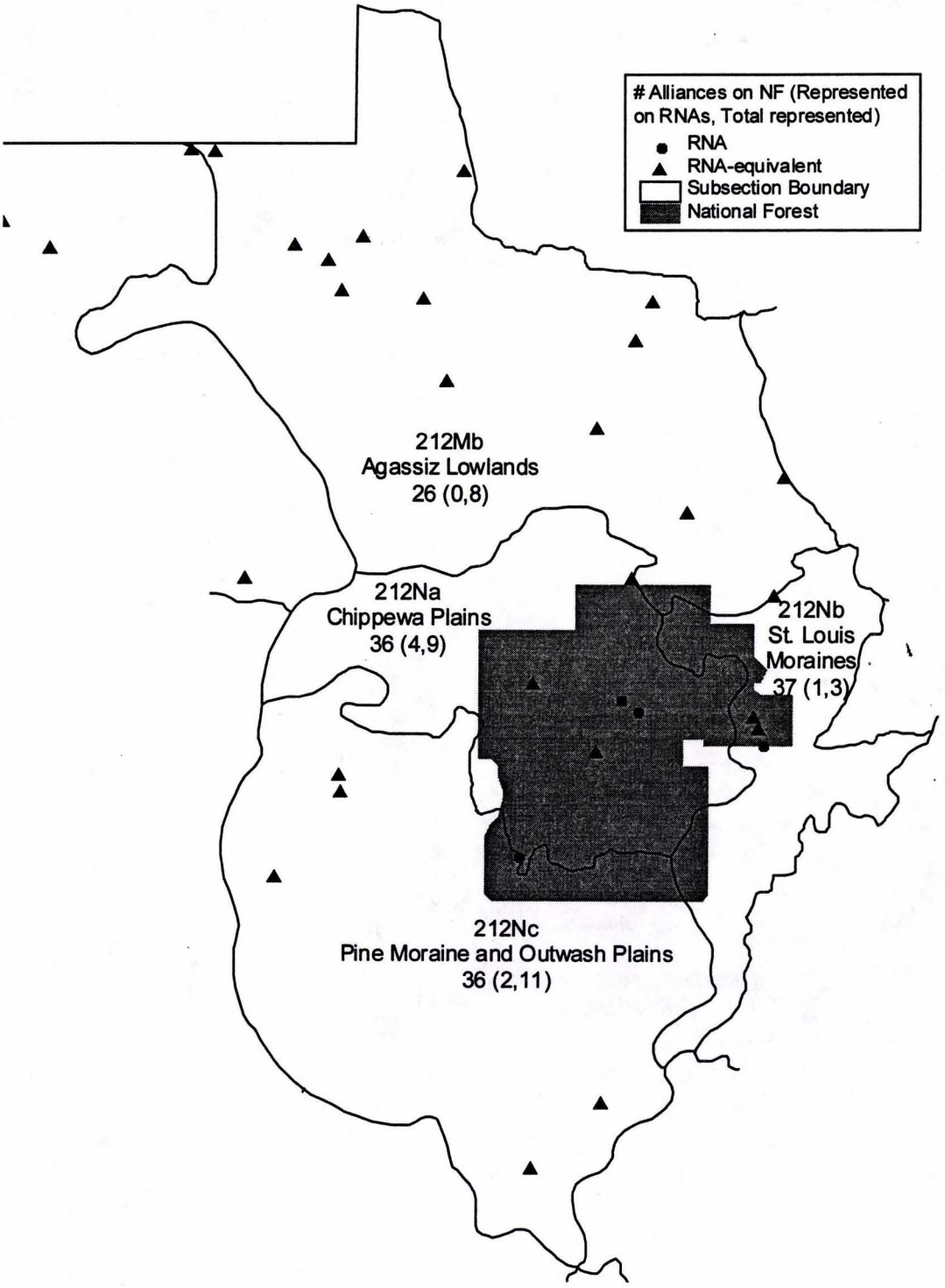
Chippewa Figure 2. The Chippewa National Forest with established RNAs and subsections*
*Pine Point RNA actually occurs in 212Nc, but appears to be in 212Na due to the differences in scales of the RNA and subsection layers. A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the USFS.



Chippewa Figure 3. Chippewa National Forest with RNAs, RNA-equivalents, and relationship to subsections. The entire Chippewa National Forest is shaded, though not all land in the shaded area is managed by the National Forest. In each subsection, the percentage of the subsection *managed* by the Chippewa National Forest (*prominence)* is shown, followed (in parentheses) by the percentage of national forest land (managed) in the subsection.



Chippewa Figure 4. Alliance representation on subsections of the Chippewa National Forest. The entire Chippewa National Forest is shaded, though not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on national forest land, and in parentheses, the number of these represented by RNAs followed by the total number represented.



Chippewa Appendix A. Subsections of the Chippewa National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Chippewa Table 5 for information on the format of this table. The difference between these two tables is that Chippewa Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Chippewa Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Chippewa NF

Community Pattern **Alliances not Reported on NF Land**	212Na (CP)		212Nb (SLM)		212Mc (PMOP)		212Mb (AL)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Black Oak - (Northern Pin Oak) Wooded Herbaceous Alliance						▪		▪
Jack Pine - (Red Pine) Wooded Herbaceous Alliance					(1)	▪		
Little Bluestem - Indian Grass Herbaceous Alliance						▪		▫
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Black Spruce Forest Alliance				▫			(1)	▪
Red Oak - Sugar Maple - (White Oak) Forest Alliance		▫		▪				
Quaking Aspen Forest Alliance						▪		▪
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance						▫		
Bur Oak - Oak (White, Northern Pin, Black) Woodland Alliance						▪		
Bur Oak Woodland Alliance						▪		▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	(1)	▪						
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance								▫
Jack Pine / Lichen Nonvascular Alliance						▫		
Rock Outcrop/Butte Sparse Vegetation								▪
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Jack Pine, Red Pine) Woodland Alliance						▫		
Sedge Saturated Herbaceous Alliance		▪						
Open Pavement Sparse Vegetation				▪				
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation		▫		▪		▪		▫

Chippewa Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Chippewa National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection* 212Na. *Chippewa Plains								
Matrix Alliances								
Red Pine Forest Alliance	Battle Point		42	D	AB	B	BC	
		Lost 40 SNA	28	D	AB	B	BC	
White Spruce - Balsam Fir - Aspen Forest Alliance		Pennington Bog SNA	20	D	AB	B	BC	
White Spruce - Balsam Fir Forest Alliance		Lost 40 SNA	16	D	AB	B	BC	
Sugar Maple - American Basswood - (Red Oak) Forest Alliance	Battle Point		121	C	AB	B	BC	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Stony Point		0				I	
Quaking Aspen - Paper Birch Forest Alliance	Battle Point		11	D	AB	B	BC	
	Stony Point		92	C	AB	B	B	
		Lost 40 SNA ?	5	D	AB	B	QBC	?
Large Patch Alliances								
Red Oak - Sugar Maple - (White Oak) Forest Alliance	Battle Point ?		68	B	AB	B	QB	?
Black Spruce Saturated Forest Alliance		Lost 40 SNA ?	30	C	AB	B	QB	?
		Pennington Bog SNA	12	C	AB	B	B	
Northern White Cedar Saturated Forest Alliance		Pennington Bog SNA	64	B	AB	B	B	
Black Ash - Red Maple Saturated Forest Alliance	Stony Point		225	B	AB	B	B	
		Pennington Bog SNA	4	D	AB	B	BC	
Black Spruce Saturated Woodland Alliance		Hole-In-the-Bog Peatland SNA	1,125	A	AB	B	A	
Speckled Alder Seasonally Flooded Shrubland Alliance		Lost 40 SNA	35	C	AB	B	B	
		Pennington Bog SNA	4	D	AB	B	BC	
Leatherleaf Saturated Dwarf-Shrubland Alliance		Hole-In-the-Bog Peatland SNA	267	C	AB	B	B	
Canada Bluejoint Seasonally Flooded Herbaceous Alliance		Pennington Bog SNA	4	C	AB	B	B	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	Battle Point		64	B	AB	B	B	
	Stony Point		0				I	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Hole-In-the-Bog Peatland SNA ?	0				QU	?
Small Patch Alliances								
Inland Strand Beach Sparse Vegetation	Stony Point		11	B	AB	B	B	
		Chippewa Plains (212Na) Total:	2,248					
Subsection* 212Nb. *St. Louis Moraines								
Matrix Alliances								
Red Pine Forest Alliance	Clustered Bur Reed		2	D	AB	B	C	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
White Pine - (Red Pine) - Quaking Aspen Forest Alliance		Wabu Woods SNA	40	D	AB	B	BC	
White Spruce - Balsam Fir - Aspen Forest Alliance		Wabu Woods SNA ?	8	D	AB	B	QBC	?
Sugar Maple - American Basswood - (Red Oak) Forest Alliance		Botany Bog SNA ?	35	D	AB	B	QBC	?
Quaking Aspen - Paper Birch Forest Alliance	Clustered Bur Reed		18	D	AB	B	BC	
		Wabu Woods SNA ?	35	D	AB	B	QBC	?
Large Patch Alliances								
Paper Birch Forest Alliance	Clustered Bur Reed		31	C	AB	B	BC	
Black Spruce Saturated Forest Alliance	Clustered Bur Reed		5	D	AB	B	C	
Northern White Cedar Saturated Forest Alliance		Ladies Tresses Swamp SNA	40	C	AB	B	B	
		Wabu Woods SNA	10	C	AB	B	BC	
Black Ash - Red Maple Saturated Forest Alliance		Wabu Woods SNA	9	C	AB	B	B	
Tamarack Saturated Forest Alliance		Botany Bog SNA ?	30	C	AB	B	QB	?
Black Spruce Saturated Woodland Alliance		Botany Bog SNA ?	40	C	AB	B	QB	?
Speckled Alder Seasonally Flooded Shrubland Alliance	Clustered Bur Reed		0				I	
		Botany Bog SNA	5	CD	AB	B	BC	
Leatherleaf Saturated Dwarf-Shrubland Alliance	Clustered Bur Reed		14	C	AB	B	B	
		Wabu Woods SNA	2	D	AB	B	BC	
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance	Clustered Bur Reed		0				I	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Botany Bog SNA ?	0				QI	?
Small Patch Alliances								
Trembling Aspen Temporarily Flooded Forest Alliance		Botany Bog SNA	7	C	AB	B	B	
		St. Louis Moraines (212Nb) Total:	331					

Subsection 212Nc. *Pine Moraine and Outwash Plains*

Matrix Alliances								
Jack Pine Forest Alliance	Pine Point		28	D	AB	B	BC	
		Greenwater Lake SNA ?	0	U			QU	?
		Itasca Wilderness Sanctuary SNA ?	5	D	AB	A	QB	?
		Paul Bunyan Savanna	27	D	AB	B	B	
Red Pine Forest Alliance	Pine Point		550	B	AB	B	B	
		Itasca Wilderness Sanctuary SNA	600	B	AB	A	A	
White Pine - (Red Pine) - Quaking Aspen Forest Alliance		Greenwater Lake SNA ?	0	U			QU	?
White Pine Forest Alliance		Itasca Wilderness Sanctuary SNA ?	55	C	AB	A	QB	?
White Spruce - Balsam Fir - Aspen Forest Alliance		Iron Springs Bog SNA ?	60	C	AB	B	QB	?
		Itasca Wilderness Sanctuary SNA	100	C	AB	A	B	
Sugar Maple - American Basswood - (Red Oak) Forest Alliance		Itasca Wilderness Sanctuary SNA ?	300	C	AB	A	QB	?
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		Lake Alexander Preserve ?	0	U	AB	B	QU	?

Community Pattern / Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		Paul Bunyan Savanna ?	21	D AB B	QBC ?
White Oak - (Red Oak, Hickory species) Forest Alliance		Lake Alexander Preserve	50	C AB B	B
Quaking Aspen - Paper Birch Forest Alliance	Pine Point		95	C AB B	B
		Itasca Wilderness Sanctuary SNA	300	C AB A	B
		Lake Alexander Preserve	450	C AB B	B
Jack Pine - (Red Pine) Wooded Herbaceous Alliance		Paul Bunyan Savanna	25	C AB B	B
Large Patch Alliances					
Jack Pine - Oak (Northern Pin, Black) Forest Alliance		Paul Bunyan Savanna	3	D AB B	BC
Black Oak - Northern Pin Oak Forest Alliance		Lake Alexander Preserve	450	B AB B	B
		Paul Bunyan Savanna ?	10	C AB B	QB ?
Black Spruce Saturated Forest Alliance		Iron Springs Bog SNA ?	100	B AB B	QB ?
		Itasca Wilderness Sanctuary SNA ?	40	C AB A	QB ?
Black Ash - Red Maple Saturated Forest Alliance		Itasca Wilderness Sanctuary SNA	110	B AB A	A
		Paul Bunyan Savanna	3	D AB B	BC
Tamarack Saturated Forest Alliance		Iron Springs Bog SNA ?	45	C AB B	QB ?
		Lake Alexander Preserve	30	C AB B	B
		Paul Bunyan Savanna	14	C AB B	B
Black Spruce Saturated Woodland Alliance		Greenwater Lake SNA	0		U
Speckled Alder Seasonally Flooded Shrubland Alliance		Greenwater Lake SNA	0		U
		Iron Springs Bog SNA	10	C AB B	B
		Itasca Wilderness Sanctuary SNA	30	C AB A	B
		Paul Bunyan Savanna	17	C AB B	B
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Itasca Wilderness Sanctuary SNA	0	U AB A	U
		Lake Alexander Preserve	30	C AB B	B
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Greenwater Lake SNA ?	0		QU ?
		Lake Alexander Preserve ?	0	U AB B	QU ?
Jack Pine / Lichen Nonvascular Alliance		Greenwater Lake SNA ?	0		QU ?
Small Patch Alliances					
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Lake Alexander Preserve	30	C AB B	B
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Greenwater Lake SNA	0		U
		Pine Moraine and Outwash Plains (212Nc) Total:	3,588		

Subsection 212Mb. *Agassiz Lowlands*

Matrix Alliances					
White Pine - (Red Pine) - Quaking Aspen Forest Alliance		Gustafson's Camp SNA	90	C AB B?	B
Large Patch Alliances					
Black Spruce Forest Alliance		Myrtle Lake Peatland SNA	1,500	B AB A	A

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Black Spruce Saturated Forest Alliance		Lost River Peatland SNA	30	A	AB	A	A	
		Pine Creek Peatland SNA	140	B	AB	B	B	
Northern White Cedar Saturated Forest Alliance		Caldwell Brook Cedar Swamp SNA	80	B	AB	B	B	
		Gustafson's Camp SNA	95	B	AB	B?	B	
		Myrtle Lake Peatland SNA	1,500	A	AB	A	A	
Tamarack Saturated Forest Alliance		Lost River Peatland SNA	623	A	AB	A	A	
		Mulligan Lake Peatland SNA	262	B	AB	A	A	
		Myrtle Lake Peatland SNA	1,725	A	AB	A	A	
		Red Lake Peatland SNA	2,483	A	AB	A	A	
Black Spruce Saturated Woodland Alliance		Lost River Peatland SNA	3,730	A	AB	A	A	
		Myrtle Lake Peatland SNA	1,360	A	AB	A	A	
		North Black River Peatland SNA	600	A	AB	B	A	
		Red Lake Peatland SNA	33,113	A	AB	A	A	
		South Black River Peatland SNA	2,395	A	AB	AB	A	
		Winter Road Lake Peatland SNA	199	B	AB	B	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance		Lost River Peatland SNA	1,777	B	AB	A	A	
		Myrtle Lake Peatland SNA	905	B	AB	A	A	
		North Black River Peatland SNA	85	C	AB	B	B	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Pine & Curry Island SNA ?	2	U	AB	B	QU	?
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Lost River Peatland SNA	3,880	A	AB	A	A	
		Mulligan Lake Peatland SNA	3,142	A	AB	A	A	
		Myrtle Lake Peatland SNA	4,330	A	AB	A	A	
		Norris Camp Peatland SNA	1,053	A	BC	B	B	
		North Black River Peatland SNA	302	B	AB	B	A	
		Pine Creek Peatland SNA	755	A	AB	B	A	
		Red Lake Peatland SNA	1,656	A	AB	A	A	
		South Black River Peatland SNA	1,500	A	AB	AB	A	
		Winter Road Lake Peatland SNA	2,220	A	AB	B	A	
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		Pine & Curry Island SNA ?	2	U	AB	B	QU	?
Small Patch Alliances								
Green Ash - (American Elm) Forest Alliance		Pine & Curry Island SNA ?	10	U	AB	B	QU	?
Trembling Aspen Temporarily Flooded Forest Alliance		Pine & Curry Island SNA	10	U	AB	B	U	
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Pine & Curry Island SNA ?	2	U	AB	B	QU	?
Bog Birch - (Willow) Saturated Shrubland Alliance		Luxemberg Peatland SNA	592	A	AB	B	A	
		Red Lake Peatland SNA	8,278	A	AB	A	A	
Wiregrass Sedge Saturated Herbaceous Alliance		Lost River Peatland SNA	1,778	A	AB	A	A	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Wiregrass Sedge Saturated Herbaceous Alliance		Mulligan Lake Peatland SNA	785	A	AB	A	A	
		Myrtle Lake Peatland SNA	9,050	A	AB	A	A	
		Norris Camp Peatland SNA	263	B	BC	B	B	
		North Black River Peatland SNA	230	B	AB	B	B	
		Pine Creek Peatland SNA	49	A	AB	B	A	
		Red Lake Peatland SNA	20,696	A	AB	A	A	
		South Black River Peatland SNA	300	B	AB	AB	A	
		Sprague Creek Peatland SNA	820	A	AB	B	A	
		Winter Road Lake Peatland SNA	50	B	AB	B	B	
Inland Strand Beach Sparse Vegetation		Pine & Curry Island SNA	10	U	AB	B	U	
Sand Flats Temporarily Flooded Sparse Vegetation		Pine & Curry Island SNA	23	U	AB	B	U	
		Agassiz Lowlands (212Mb) Total:	114,480					
		Grand Total:	120,647					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Chippewa Appendix C. Unrepresented alliances (Forest-wide) on the Chippewa National Forest

The following alliances are not represented in any of the subsections in which they occur on Chippewa National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- White Pine Forest Alliance (matrix, limited)
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (matrix, widespread)
- Northern White Cedar - Yellow Birch Forest Alliance (large patch, endemic)
- Jack Pine - Oak (Northern Pin, Black) Forest Alliance (large patch, endemic)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (large patch, limited)
- Paper Birch Forest Alliance (large patch, widespread)
- Silver Maple Temporarily Flooded Forest Alliance (large patch, peripheral)
- Cattail species - (Bulrush speices, Rush species) Seasonally Flooded Herbaceous Alliance (large patch, widespread)
- Tussock Sedge Seasonally Flooded Herbaceous Alliance (large patch, widespread)
- Green Ash - (American Elm) Forest Alliance (small patch, peripheral)
- Trembling Aspen Temporarily Flooded Forest Alliance (small patch, limited)
- Lake Sedge Seasonally Flooded Herbaceous Alliance (small patch, widespread)
- Sedge species (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance (small patch, widespread)
- Wild Rice Species Semipermanently Flooded Herbaceous Alliance (small patch, limited).
- Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance (small patch, widespread)
- Cobble/Gravel Shore Sparse Vegetation (small patch, endemic)
- Sand Flats Temporarily Flooded Sparse Vegetation (small patch, widespread)

IX. D. Green Mountain and Finger Lakes National Forest RNA Assessment

GREEN MOUNTAIN & FINGER LAKES SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Green Mountain and Finger Lakes National Forests. An Executive Summary for the entire document is given on pages iv-vi. **This portion of the assessment is preliminary, as not all aspects of the assessment could be thoroughly conducted for the Green Mountain and Finger Lakes.**

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Green Mountain and Finger Lakes National Forest land. The two Forests are treated separately in this assessment.

Green Mountain National Forest

The Green Mountain occupies portions of 6 subsections. Based on data from 5 of the 6 subsections, at least 25 alliances occur on the Green Mountain National Forest, ranging from 12 to 20 per subsection. In these 5 subsections there are 76 subsection-alliance combinations; these are the known ecosystems to represent for the Green Mountain National Forest. Data still need to be compiled for Subsection M212Cc.

Finger Lakes National Forest

The Finger Lakes National Forest occupies portions of 2 subsections. Nine alliances have been reported to occur on the Finger Lakes National Forest, and each is assumed to occur in both subsections. Therefore there are 18 subsection-alliance combinations on the Finger Lakes lands; these are the ecosystems to represent for the Finger Lakes National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forests.

CURRENT REPRESENTATION OF ECOSYSTEMS

Green Mountain National Forest

Two of the Green Mountain alliance-subsection combinations (ecosystems) are represented by the 1 currently established Green Mountain RNA. Existing **RNA-equivalents** identified to date in the two dominant subsections of Green Mountain National Forest include:

- 1 state natural area, and
- 1 university preserve.

These 2 RNA-equivalents, along with the 1 RNA, currently represent 2 (3%) of the 76 identified Green Mountain ecosystems. The number of represented ecosystems is possibly larger because RNA-equivalents have not been thoroughly identified. Identifying additional RNA-equivalents and ranking the alliances that occur on them could quickly reduce the number of unrepresented ecosystems..

Finger Lakes National Forest
There are no RNAs on the Finger Lakes National Forest. **RNA-equivalents** have not yet been identified on the Finger Lakes subsections. Thus all 18 alliance-subsection combinations (ecosystems) are unrepresented.

UNREPRESENTED ECOSYSTEMS

Green Mountain National Forest
On the Green Mountain National Forest, 74 alliance-subsection combinations are unrepresented.

Finger Lakes National Forest
All 18 alliance-subsection combinations (ecosystems) are unrepresented.

Methods for filling these gaps include:

- confirming ecosystems to represent, and which ones are represented
- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

Green Mountain National Forest
Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Green Mountain National Forest are:

- Southern Green Mountain (M212Cd)
- The Northern Green Mountain (M212Ca)

The Tacomic Mountains (M212Cb) is a **medium-priority subsection** based on prominence.

Low-priority subsections are the Berkshire-Vermont Upland (M212Cc), the Champlain Glacial Lake and Marine Plains (212Ec) and the Champlain Hills (212Ed). These subsections have marginal prominence in the Green Mountain, but they should be evaluated for special land type or other ecological features before deciding if little or no representation should occur.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), then **high-priority alliances** may be high-priority in each of the subsections in which they occur. This assessment did analyzing the community pattern for alliances in the Eastern States.

Finger Lakes National Forest
There are only 2 subsections on the Finger Lakes National Forest. The prominence of the National Forest in both subsections is low, so instead we have prioritized the subsections by the percent of National Forest land in the subsection (dominance). Using this method the **high-priority subsection** is:

- Cattaraugus Finger Lakes Moraine and Hills Subsection (222Id)

The remaining subsection, Central Allegheny Plateau (212Fb) is a **medium-priority subsection.** It is 27% of the Finger Lakes National Forest.

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IX.D.1. INTRODUCTION

The Green Mountain National Forest is located along the western border of Vermont (Green Mountain and Finger Lakes 1). Its proclamation boundaries and purchase unit boundaries contain 815,000 acres; 365,907 acres (45%) of this land is managed (FY97) by the Green Mountain National Forest.

The Finger Lakes National Forest is managed by the Green Mountain National Forest, but it is treated as a separate National Forest for the purposes of this assessment. It is located in central New York and is 13,232 acres (FY97) in size. It has no proclamation boundaries, and the entire area is managed by the Forest Service.

IX.D.2. METHODS

See Methods of the assessment for a more detailed description of methods. The following section describes methods specific to the Green Mountain and Finger Lakes.

IX.D.2.a. Subsections

We identified the subsections occurring on the Green Mountain and Finger Lakes National Forests using the digital subsection map of Keys *et al.* (1995) produced at a scale of 1:3,500,000 and a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo). We used the digital maps to determine the amount of land in each subsection within Green Mountain National Forest boundaries. We considered the ownership acreage within each subsection for the Green Mountain as 45% of the acreage within proclamation boundaries, based on the ratio ownership to proclamation acres for the entire Green Mountain National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. The Finger Lakes National Forest has 100% ownership within its boundaries, so an ownership adjustment was not needed.

From estimated ownership acreage we calculated the percentage of national forest land (ownership) in each subsection, and the percentage of each subsection with national forest land (ownership). The percentage of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percentage of the national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.D.2.b. Distribution of alliances among subsections

To create the list of alliances for Green Mountain and Finger Lakes subsections, Mark Anderson of The Nature Conservancy's Eastern Conservation Science Division provided us with a 1994 alliance-by-subsection list that was developed by the Nature Conservancy and state Natural Heritage Programs. This list was updated to incorporate changes in the classification (Grossman *et al.* 1998).

The subset of these alliances which occur on Green Mountain National Forest land were identified by Diane Burbank of the Green Mountain National Forest as part of a 1994 representative RNA pilot study. Subsection M212Cc was not included in the pilot results, so National Forest data are unavailable for this subsection. The pilot study did not distinguish between the Northern Green Mountain (M212Ca) and Southern Green Mountain (M212Cd) Subsections, because they formerly comprised a single subsection. As a result it was unclear whether alliances identified on national forest land in the combined subsection occurred in both of the new subsections or only one. To resolve this problem, for each alliance listed in

the pilot we chose one or both subsections based on our Nature Conservancy alliance-by-subsection data. For example, an alliance identified by Nature Conservancy data as occurring in subsection M212Ca but not M212Cd, and identified by the pilot as occurring on national forest land, was assumed to occur on national forest land in subsection M212Ca. The alliance lists for these two subsections need review by Heritage Program and Forest Service personnel.

The subset of alliances (from the Anderson list) that occur on Finger Lakes National Forest land were identified using information from a 1990 potential Research Natural Area survey by the New York Natural Heritage Program and from CDS compartment records. We assumed that alliances identified in this way occur on national forest land in both subsections of the National Forest. The data still need review by Heritage Program and Forest Service personnel.

IX.D.2.c. Identifying RNA-equivalents

A discussion of what constitutes RNA-equivalents for the Green Mountain and Finger Lakes National Forests has not taken place. However, based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents in this assessment (Green Mountain and Finger Lakes Table 2):

- All State Natural Areas[6] and
- All of The Nature Conservancy's (TNC's) preserves[7].

A University of Vermont preserve has also been included as an RNA-equivalent in this preliminary assessment, but its RNA-equivalent status should be further evaluated. Some portions are too heavily visited to serve as an RNA-equivalent, but other portions are suitable due to limited to no impacts from visitors.

For the Green Mountains National Forest, we used Heritage Element Occurrences to list potential RNA-equivalents in M212Cd and M212Ca. Element Occurrence data were not available for the other subsections. Only two areas in M212Ca seemed to meet RNA-equivalency criteria. The RNA Committee of the White Mountain National Forest can work with conservation partners to review the selection of these 2 areas and to evaluate additional areas or designations for RNA-equivalency.

We did not have information available to identify RNA-equivalents for the Finger Lakes National Forest.

IX.D.2.d. Digitizing RNAs

The Green Mountain National Forest provided USGS 7.5 minute (1:24,000 scale) topographical maps with an outline of The Cape RNA. We hand-digitized the boundary line using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Green Mountain RNAs in the projection used by the Green Mountain National Forest (Stateplane 5526 meters), or a Region-wide RNA cover at regional projections.

IX.D.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in

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[6] Keep in mind that some subsections of the Green Mountain National Forest occur in both Vermont and New York, and RNA-equivalents in both states are relevant to this Forest.

[7] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

The only RNA-equivalent data in the Green Mountain come from Element Occurrence data (subsections M212Ca and M212Cd only). These data are clearly incomplete.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not provide representation. Instead it is listed with a question mark in Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Green Mountain National Forest; answered questions may result in additional represented alliance-subsection-combinations.

IX.D.3. PRELIMINARY RESULTS

This report is preliminary, as not all aspects of the assessment could be thoroughly conducted.

IX.D.3.a. Subsections on national forest land

Green Mountain National Forest

The 6 subsections which occur on Green Mountain National Forest land are:

- Southern Green Mountain (M212Cd)
- Northern Green Mountain (M212Ca)
- Tacomic Mountains (M212Cb)
- Berkshire-Vermont Upland (M212Cc)
- Champlain Glacial Lake and Marine Plains (212Ec)
- Champlain Hills (212Ed)

The Green Mountain National Forest occurs primarily (62%) in the Southern Green Mountains Subsection (M212Cd), with most of the remainder (30%) in the Northern Green Mountains Subsection (M212Ca; Green Mountain and Finger Lakes Table 4a). The National Forest manages 39% and 11% of these subsections, respectively. The remaining subsections each make up less than 5% of the National Forest, and less than 5% of each is managed by the National Forest.

The percent of a subsection managed by the Forest Service gives an indication of the *prominence* of land coverage by the Forest in the subsection. In this report, subsections are listed in order of prominence (Green Mountain and Finger Lakes Table 4).

Finger Lakes National Forest

The 2 subsections which occur on Finger Lakes National Forest land are:

- Cattaraugus Finger Lakes Moraine and Hills (222Id)
- Central Allegheny Plateau (212Fb)

The Finger Lakes National Forest occurs primarily (73%) in the Cattaraugus Finger Lakes Moraine and Hills (222Id; Green Mountain and Finger Lakes Table 4b). However, less than 1% of each subsection is managed by the National Forest.

IX.D.3.b. Natural communities within subsections

Green Mountain National Forest

A total of 64 alliances are reported to occur in the 6 subsections of the Green Mountain National Forest. Of these, 25 are known to be on Green Mountain National Forest land (Green Mountain and Finger Lakes Table 5a, first column) in 5 of the 6 subsections. (National Forest data are unavailable for Subsection M212Cc.) The 39 alliances not reported to occur on national forest land are listed in Green Mountain and Finger Lakes Appendix A1.

Of the 25 alliances reported to occur on Green Mountain National Forest land, 1 is a **matrix** alliance (see Green Mountain and Finger Lakes Table 5a, first set of alliances), 11 are **large patch** (second set) and 13 are **small patch** (third set). (See "National Vegetation Classification".)

The number of alliances on national forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on national forest land in each subsection:

- M212Cd (Southern Green Mountain): 14 alliances (1 matrix, 5 large patch, 8 small patch)
- M212Ca (Northern Green Mountain): 16 alliances (1 matrix, 7 large patch, 8 small patch)
- M212Cb (Tacomic Mountains): 14 alliances (1 matrix, 7 large patch, 6 small patch)
- M212Cc (Berkshire-Vermont Upland): *no National Forest alliance data available*
- 212Ec (Champlain Glacial Lake and Marine Plains): 20 alliances (1 matrix, 11 large patch, 8 small patch)
- 212Ed (Champlain Hills): 12 alliances (1 matrix, 6 large patch, 5 small patch)

Based on available data, there are a total of 76 subsection-alliance combinations on Green Mountain National Forest land. Green Mountain and Finger Lakes Table 5a shows the alliances that occur in each subsection.

Finger Lakes National Forest

A total of 18 alliances are reported to occur in these 2 subsections. Of these, 9 are known to be on Finger Lakes National Forest land (Green Mountain and Finger Lakes Table 5b, first column); the 9 alliances reported not to occur on national forest land are listed in Green Mountain and Finger Lakes Appendix A2.

Of the 9 alliances reported to occur on Finger Lakes National Forest land, 3 are **matrix** alliances (see Green Mountain and Finger Lakes Table 5b, first set of alliances), 3 are **large patch** (second set) and 3 are **small patch** (third set). (See "National Vegetation Classification".)

The number of alliances on Finger Lakes National Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on national forest land in each subsection:

- 222Id (Cattaraugus Finger Lakes Moraine and Hills): 9 alliances (3 matrix, 3 large patch, 3 small patch)
- 212Fb (Central Allegheny Plateau): 9 alliances (3 matrix, 3 large patch, 3 small patch)

Based on available data, there are a total of 18 subsection-alliance combinations on Finger Lakes National Forest land. Green Mountain and Finger Lakes Table 5b shows the alliances that occur in each subsection.

IX.D.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation on the Green Mountain and Finger Lakes National Forests is provided by one RNA and 2 RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance-subsection combination on the RNA and the RNA-equivalents are shown in the appropriate cells of Green Mountain and Finger Lakes Tables 5a. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed. See Green Mountain and Finger Lakes Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

There is 1established RNA (Green Mountain and Finger Lakes Tables 1, 6a) and 4 candidate RNAs (cRNAs) on the Green Mountain National Forest. There are no RNAs and 8 cRNAs on the Finger Lakes National Forest. Candidate RNAs are not typically part of this RNA assessment because they do not yet have Level I protection status (but see RNA-equivalents below).

A digital cover of the established RNA on the Green Mountain National Forest is available in the projection used by the Green Mountain National Forest (Stateplane Fipszone 5526, meters, NAD 27) from the Regional RNA Coordinator. An Eastern States National Forest RNA cover is also available.

RNA-equivalents

Based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents in this assessment (Green Mountain and Finger Lakes Table 2):

- All State Natural Areas[8] and
- All of The Nature Conservancy's (TNC's) preserves.

For the Green Mountain National Forest, from our limited information, we identified only two RNA-equivalents: Morristown Bog State Natural Area and the University of Vermont's Mount Mansfield Natural Area (Green Mountain and Finger Lakes Table 6a, 7a). The RNA-equivalent status of Mount Mansfield Natural Area should be reviewed; some portions are too heavily impacted by visitor use to serve as an RNA-equivalent, but other portions are suitable.

For the Finger Lakes National Forest, no RNA-equivalents have been identified. However, all 8 cRNAs on the Finger Lakes have been given a Special Area (8.1) designation. These areas should be reviewed for RNA-equivalency in representing alliance-subsection combinations (ecosystems) (see Appendix C for list of alliances for each Special Area).

A more thorough search for RNA-equivalents for the Green Mountain and Finger Lakes National Forests is needed. Green Mountain and Finger Lakes National Forests personnel can work with conservation partners to find additional areas or designations for RNA-equivalency. Some designations to consider are shown in Green Mountain and Finger Lakes Table 3.

[8] Keep in mind that some subsections of the Green Mountain National Forest occur in both Vermont and New York, and RNA-equivalents in both states are relevant to this Forest.

Green Mountain National Forest

Subsection M212Cd (Southern Green Mountain)

Subsection M212Cd contains no RNAs, and we have no information about RNA-equivalents. Therefore, none of the 1 matrix, 5 large patch, or 8 small patch alliances reported from National Forest land are represented (Green Mountain and Finger Lakes Table 5a, column M212Cd; Green Mountain and Finger Lakes Table 7Ab).

Subsection M212Ca (Northern Green Mountain)

Subsection M212Ca contains 1 RNA (Green Mountain and Finger Lakes Table 6a, 7Aa):

- The Cape (290),

that represents 0.02% of the subsection land area.

The RNA-equivalents identified to date are:

- Morristown Bog (30 acres), a Vermont State Natural Area, and
- Mount Mansfield Natural Area (400 acres), a University of Vermont preserve.

Together the RNA and RNA-equivalents protect 720 acres (0.07%) of the subsection (Green Mountain and Finger Lakes Table 7a). However, the RNA-equivalency status of Mount Mansfield Natural Area needs review; it is likely that a portion much smaller than 400 acres will be determined to be an RNA-equivalent; large portions of the Natural Area are too heavily visited to serve as an RNA-equivalent. Furthermore, a more complete search for RNA-equivalents in the subsection is needed.

Natural communities (alliances)

Of the 16 alliances reported to be on Forest land in Subsection M212Ca, 2 are represented by high-quality occurrences (A- or B-ranked) on The Cape RNA (Green Mountain and Finger Lakes Table 5a, column M212Ca; Green Mountain and Finger Lakes Table 7b). The 2 alliances identified on the 2 RNA-equivalents are not represented in this subsection because of the poor condition of the occurrences.

Based on current information, the one matrix alliance is represented, 1 of the 7 large patch alliances is represented, and none of the 8 small patch alliances are represented.

Subsection M212Cb (Tacomic Mountains)

Subsection M212Cd contains no RNAs, and we have no information about RNA-equivalents. Therefore, none of the 1 matrix, 7 large patch, or 6 small patch alliances reported from National Forest land are represented (Green Mountain and Finger Lakes Table 5a, column M212Cb; Green Mountain and Finger Lakes Table 7b).

Subsection M212Cc (Berkshire-Vermont Upland)

Subsection M212Cc contains no RNAs. We have no information about RNA-equivalents or alliances on National Forest land in this subsection. Thus representation goals are still undefined.

Subsection 212Ec (Champlain Glacial Lake and Marine Plains)

Subsection 212Ec contains no RNAs, and we have no information about RNA-equivalents. Therefore, none of the 1 matrix, 11 large patch, or 8 small patch alliances reported from National Forest land are represented (Green Mountain and Finger Lakes Table 5a, column 212Ec; Green Mountain and Finger Lakes Table 7Ab).

Subsection 212Ed (Champlain Hills)

Subsection M212Cd contains no RNAs, and we have no information about RNA-equivalents. Therefore, none of the 1 matrix, 6 large patch, or 5 small patch alliances reported from National Forest land are represented (Green Mountain and Finger Lakes Table 5a, column 212Ed; Green Mountain and Finger Lakes Table 7Ab).

Finger Lakes National Forest

Subsection 222Id (Cattaraugus Finger Lakes Moraine and Hills)

Subsection 222Id contains no RNAs, and we have no information about RNA-equivalents. Therefore, no alliances are currently represented (Green Mountain and Finger Lakes Tables 5b, 7Bb).

Subsection 212Fb (Central Allegheny Plateau)

Subsection M212Cd contains no RNAs, and we have no information about RNA-equivalents. Therefore, no alliances are currently represented (Green Mountain and Finger Lakes Tables 5b, 7Bb).

IX.D.3.d. Synthesis: Needs for ecosystem representation

The table in each section below summarizes the needs for representation, and shows a suggested priority ranking of the subsections based on prominence and representation of biological variation (% alliances represented). The reasoning behind the priority scheme in this table is described below each table. **These findings are preliminary, as not all aspects of the assessment could be thoroughly conducted.** The percent of National Forest land and percent acres represented in each subsection was not used to prioritize the subsections, though the RNA Committee may choose to do so.

The *complete* list of needs is shown in Green Mountain and Finger Lakes Tables 5a and 5b by shaded cells that contain no number.

Green Mountain National Forest

Subsection	Dominance Percentage of NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on NF lands	Percentage of NF alliances represented	Proposed priority
M212Cd (Southern Green Mountain)	59	*unknown*	39	*unknown*	high
M212Ca (Northern Green Moutain)	29	0.07?	11	13 *(or more?)*	high
M212Cb (Tacomic Mountains)	4	*unknown*	2	*unknown*	medium
M212Cc (Berkshire-Vermont Upland)	2	*unknown*	1	*unknown*	low
212Ec (Champlain Glacial Lake and Marine Plains)	2	*unknown*	1	*unknown*	low
212Ed (Champlain Hills)	0.23	*unknown*	0.21	*unknown*	low

Summary of needs

The proposed priority for the Green Mountain National Forest subsections is the same as that of descending prominence of the subsections. There is not enough community information for the National Forest to prioritize based on representation of biological variation.

The Southern Green Mountain (M212Cd) and Northern Green Mountain (M212Ca) Subsections are high priority for future representation because of high prominence (39 and 11%) and high dominance (59 and 29%).

The Tacomic Mountains (M212Cb) Subsection is medium priority with 2% prominence and 4% dominance. The remaining 3 subsections are low priority due to low prominence and dominance. However, these subsections should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

Unrepresented alliances either have not been identified on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented. Many ecosystems are identified as unrepresented simply due to lack of information.

Subsection M212Cd (Southern Green Mountain)

None of the 14 alliances in this subsection are represented. Considering the Green Mountain National Forest's prominence in this subsection, further representation of the biological variation in this subsection is especially important. The highest priority for this subsection may be to do a more complete search for RNA-equivalents and determine which alliances they represent.

The single matrix alliance may be the highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Subsection M212Ca (Northern Green Mountain)

Of 16 alliances, 2 are represented, leaving 13 (87%) alliances in need of representation. The highest priority for this subsection may be to do a more complete search for RNA-equivalents and determine which alliances they represent.

The single matrix alliance may be the highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Subsection M212Cb (Tacomic Mountains)

None of the 14 alliances in this subsection are represented. The highest priority for this subsection may be to do a more complete search for RNA-equivalents and determine which alliances they represent.

The single matrix alliance may be the highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Subsection M212Cc (Berkshire-Vermont Upland)

No alliances have been identified on the estimated 9,132 acres of Green Mountain land in this subsection. The ecosystems to represent are unknown and cannot be represented until alliances have been identified on national forest land.

Subsection 212Ec (Champlain Glacial Lake and Marine Plains)

None of the 20 alliances in this subsection are represented. The single matrix alliance may be the highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Subsection 212Ed (Champlain Hills)

None of the 12 alliances in this subsection are represented. The single matrix alliance may be the highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Finger Lakes National Forest

Subsection	Dominance Percentage of NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on NF lands	Percentage of NF alliances represented	Proposed priority
222Id (Cattaraugus Finger Lakes Moraine and Hills)	73	*unknown*	0.79	*unknown*	high
212Fb (Central Allegheny Plateau)	27	*unknown*	0.07	*unknown*	medium

Summary of needs

The prominence of the Finger Lakes National Forest in both subsections is low, so instead we have prioritized the subsections by the percentage of land in the subsection (*dominance*). There is no information about alliance representation in these subsections, so we cannot prioritize based on representation of biological variation.

The highest priority to represent is the Cattaraugus Finger Lakes Moraine and Hills Subsection (222Id), which is 73% of the National Forest. The remainder of the Forest (27%) is the Central Allegheny Plateau Subsection (212Fb), and we have given it medium priority to represent.

Subsection 222Id (Cattaraugus Finger Lakes Moraine and Hills)

The highest priority for this subsection may be to do a more complete search for RNA-equivalents and determine which alliances they represent. The three matrix alliances may be the highest priority to represent in this subsection:

- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance
- American Beech - Sugar Maple - (Tuliptree) Forest Alliance
- Red Oak - Sugar Maple - (White Oak) Forest Alliance

Subsection 212Fb (Central Allegheny Plateau)

The highest priority for this subsection may be to do a more complete search for RNA-equivalents and determine which alliances they represent. The three matrix alliances may be the highest priority to represent in this subsection:

- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance
- American Beech - Sugar Maple - (Tuliptree) Forest Alliance
- Red Oak - Sugar Maple - (White Oak) Forest Alliance

GREEN MOUNTAIN AND FINGER LAKES TABLES

Green Mountain and Finger Lakes Table 1. Established research natural areas (RNAs) of the Green Mountain and Finger Lakes National Forests

RNA	Acres	Subsection	Established	National Forest
The Cape	290	M212Ca	1993	Green Mountain

Green Mountain and Finger Lakes Table 2a. Designations identified to date as RNA-equivalents for the Green Mountain National Forest

Protected area designation	Managed by
State Natural Areas	Vermont Agency of Natural Resources
all preserves of The Nature Conservancy (TNC)	The Nature Conservancy (private)
University of Vermont Private Natural Area*	University of Vermont

*The RNA-equivalent status of these areas must be decided on a case-by-case basis. The RNA-equivalent status of Mount Mansfield Natural Area should be reviewed.

Green Mountain and Finger Lakes Table 2b. Designations identified to date as RNA-equivalents for the Finger Lakes National Forest

Protected area designation	Managed by
none identified to date	

Green Mountain and Finger Lakes Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Green Mountain and Finger Lakes National Forests
The Green Mountain National Forest may work with these organizations to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Special Areas, including Wilderness	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities

Green Mountain and Finger Lakes Table 4a. Subsections of the Green Mountain National Forest (NF), in order of prominence

"NF acres" is the number of acres of national forest land (ownership) in the subsection. "Prominence" is the percentage of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Green Mountain NF total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Green Mountain and Finger Lakes Figure 3a.

Subsection	Total subsection acres	Green Mountain NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF land in subsection
M212Cd–Southern Green Mountain	576,370	225,900	39	62
M212Ca–Northern Green Mountain	1,024,600	109,057	11	30
M212Cb–Tacomic Mountains	919,370	13,932	2	4
M212Cc–Berkshire-Vermont Upland	1,001,611	9,132	1	2
212Ec–Champlain Glacial Lake and Marine Plains	1,017,592	7,015	1	2
212Ed–Champlain Hills	424,998	871	0.21	0.2
Green Mountain NF total ownership:		365,907		

Green Mountain and Finger Lakes Table 4b. Subsections of the Finger Lakes National Forest (NF), in order of prominence

"NF acres" is the number of acres of Finger Lakes National Forest land (ownership) in the subsection. "Prominence" is the percentage of the subsection on Finger Lakes lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Finger Lakes total ownership, and these percentages do add to 100, within rounding error. All values are approximate; for example, reported acres of the Finger Lakes is 13,232 acres, rather than the 16,068 calculated from digital maps. See also Green Mountain and Finger Lakes Figure 3b.

Subsection	Total subsection acres	Finger Lakes NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF land in subsection
222Id–Cattaraugus Finger Lakes Moraine and Hills	1,480,657	11,768	0.79	73
212Fb–Central Allegheny Plateau	5,796,054	4,300	0.07	27
Finger Lakes National Forest total ownership:		16,068		

Green Mountain and Finger Lakes Table 5a [preliminary]. Subsections and alliances reported on Green Mountain National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Green Mountain and Finger Lakes Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) SGM= Southern Green Mountain, NGM= Northern Green Mountain, TM= Taconic Mountains, BV = Berkshire-Vermont Upland, CG= Champlain Glacial Lake and Marine Plains, CH= Champlain Hills. For a list of alliances occurring in subsections of the Green Mountain and Finger Lakes NFs but not reported on NF land, see Green Mountain and Finger Lakes Appendix A. For alliance nomenclature, see Overview

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Green Mountain NF

Community Pattern **Alliances Reported on NF Land**	M212Cd* (SGM)		M212Ca* (NGM)		M212Cb (TM)		M212Cc§ (BV)		212Ec (CG)		212Ed (CH)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	▪		1 ▪		▪		▪		▪		▪	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance	▪		▪		▪		▪		▪		▪	
Eastern White Pine - Eastern Hemlock Forest Alliance	▪		▫		▪		▪		▪			
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	▪		▪		▪		▪		▪		▪	
Red Oak - Sugar Maple - (White Oak) Forest Alliance	▪		▪		▪		▪		▪		▪	
Rock Chestnut Oak - Red Oak Forest Alliance									▪			
Sugar Maple - White Ash - American Basswood Forest Alliance	▪		1 ▪		▪		▪		▪		▪	
Quaking Aspen - Paper Birch Forest Alliance	▪		▪		▪				▪		▪	
Red Maple - Green Ash Seasonally Flooded Forest Alliance	▪		▪						▪			
Northern White Cedar - Red Maple Saturated Forest Alliance	▫		▪				▫		▪		▫	
Northern White Cedar Saturated Forest Alliance									▪			
Red Spruce - Red Maple Saturated Forest Alliance			▪		▪		▪		▪		▪	

* These subsections were combined when data about alliances on National Forest land were compiled.

§ No information about alliances on National Forest land is available at this time.

Community Pattern **Alliances Reported on NF Land**	**Subsections of Green Mountain NF**											
	M212Cd* (SGM)		**M212Ca* (NGM)**		**M212Cb (TM)**		**M212Cc§ (BV)**		**212Ec (CG)**		**212Ed (CH)**	
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance	▪						▪		▪			
Eastern Red-cedar - (Post Oak, Black Oak, Blackjack Oak) Forest Alliance	▪			▫	▪							
White Pine Forest Alliance									▪			
(Jack Pine, Red Pine) Woodland Alliance	▪		▪				▪		▪		▪	
Red Spruce Woodland Alliance			▪		▪				▪		▪	
Smooth Alder Temporarily Flooded Shrubland Alliance	▪		▪		▪		▫		▪		▪	
Leatherleaf / Wiregrass Sedge Saturated Shrub Herbaceous Alliance	▪		▪				▪		▪		▪	
(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) Dwarf-shrubland Alliance	▪		▪				▪					
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪		▪				▪		▪		▫	
Bigelow's Sedge - Three-forked Rush Herbaceous Alliance			▪									
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▪		▫		▪		▫		▪		▪	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪		▪		▪		▫		▪		▪	
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance	▪		▪		▪		▫		▪		▪	

* These subsections were combined when data about alliances on National Forest land were compiled.

§ No information about alliances on National Forest land is available at this time.

Green Mountain and Finger Lakes Table 5b [preliminary]. Subsections and alliances reported on Finger Lakes National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Green Mountain and Finger Lakes Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) CF= Cattaraugus Finger Lakes Moraine and Hills, CAP= Central Allegheny Plateau. For a list of alliances occurring in subsections of the Finger Lakes NF but not reported on NF land, see Green Mountain and Finger Lakes Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Finger Lakes NF

Community Pattern **Alliances Reported on NF Land**		222Id (CF)		212Fb (CAP)	
Matrix Alliances	**Rank:**	**AB**	**C**	**AB**	**C**
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance		▪		▪	
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		▪		▪	
Red Oak - Sugar Maple - (White Oak) Forest Alliance		▪		▪	
Large Patch Alliances	**Rank:**	**AB**	**C**	**AB**	**C**
Sugar Maple - White Ash - American Basswood Forest Alliance		▪		▪	
White Oak - (Red Oak, Hickory species) Forest Alliance		▪		▪	
Small Patch Alliances	**Rank:**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance		▪		▪	
Quaking Aspen - Paper Birch Forest Alliance		▪		▪	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		▪		▪	
Red Maple - Green Ash Seasonally Flooded Forest Alliance		▪		▪	

Green Mountain and Finger Lakes Table 6a. RNAs and RNA-equivalents of the Green Mountain National Forests

Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec -tion	RNA (acres)	RNA-equivalent (acres)	
		State Natural Area	University of Vermont
M212Cd			
M212Ca	The Cape RNA (290)	Morristown Bog (30)	Mount Mansfield
M212Cb			
M212Cc			
212Ec			
212Ed			

Green Mountain and Finger Lakes Table 6b. RNAs and RNA-equivalents of the Finger Lakes National Forest

Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsection	RNA	RNA-Equivalent
222Id	None	none identified to date
212Fb	None	none identified to date

Green Mountain and Finger Lakes Table 7A. Summary of subsection representation on the Green Mountain National Forest

7Aa. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect in each subsection

The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land. *? = unknown*

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
M212Cd. Southern Green Mountain					*?*
M212Ca. Northern Green Mountain	1	2 *(+)*	290	430[§]	720[§] *<1%*
M212Cb. Taconic Mountains		*?*			*?*
M212Cc. Berkshire-Vermont Upland		*?*			*?*
212Ec. Champlain Glacial Lake and Marine Plains		*?*			*?*
212Ed. Champlain Hills		*?*			*?*
TOTAL	1	*?*	290	430 *(+)*	720 *(+)*

[§]This number may decrease with reevaluation of the RNA-equivalency of Mount Mansfield Natural Area, and may increase with a more complete selection of RNA-equivalents in the subsection.

7Ab. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)

Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *? = unknown*

Subsection	# Alliances on NF land	Alliance representation			Low-quality*
		RNA	RNA-eq	Total	
M212Cd. Southern Green Mountain	14			*?*	
M212Ca. Northern Green Mountain	16	2 *13%*	*?*	*?*	
M212Cb. Taconic Mountains	14		*?*	*?*	
M212Cc. Berkshire-Vermont Upland	*?*		*?*	*?*	
212Ec. Champlain Glacial Lake and Marine Plains	20		*?*	*?*	
212Ed. Champlain Hills	12		*?*	*?*	

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.

Green Mountain and Finger Lakes Table 7B. Summary of subsection representation on the Finger Lakes National Forest.

7Ba. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect in each subsection

The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land. *? = unknown*

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
222Id. Cattaraugus Finger Lakes Moraine and Hills		?		?	?
212Fb. Central Allegheny Plateau		?		?	?

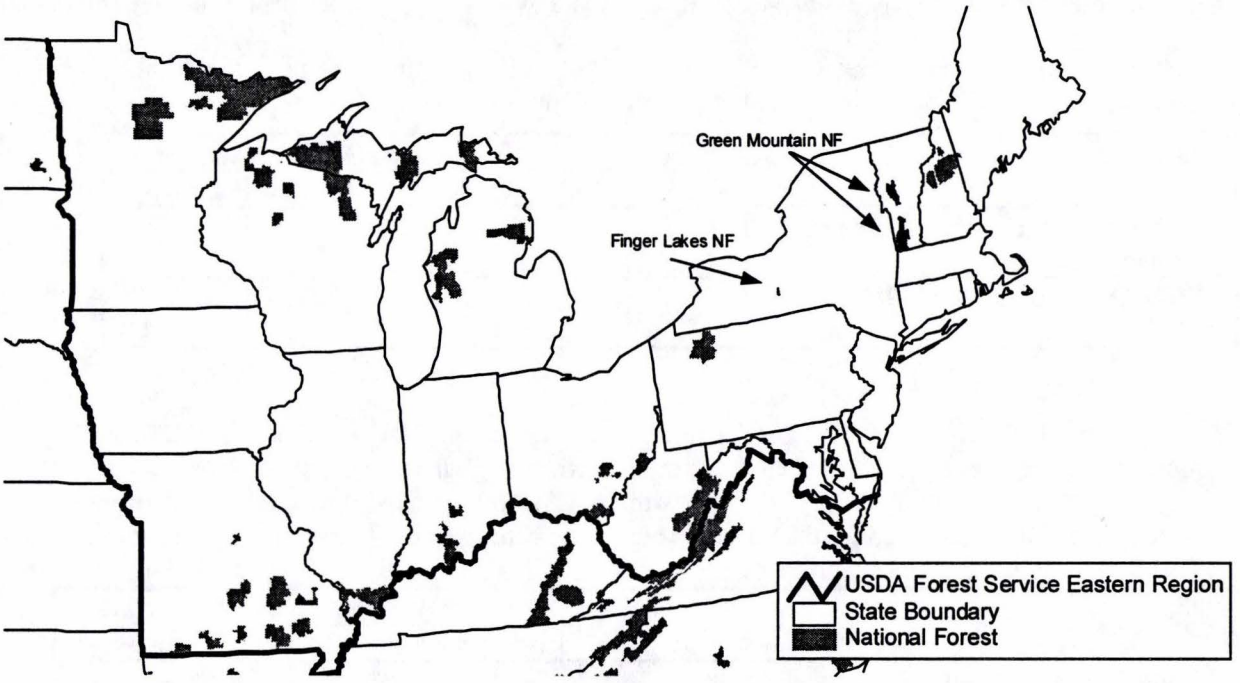
7Bb. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for Representation"). Alliances with only D-ranked occurrences are not counted. *? = unknown*

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
222Id. Cattaraugus Finger Lakes Moraine and Hills	9		?	?	
212Fb. Central Allegheny Plateau	9		?	?	

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.

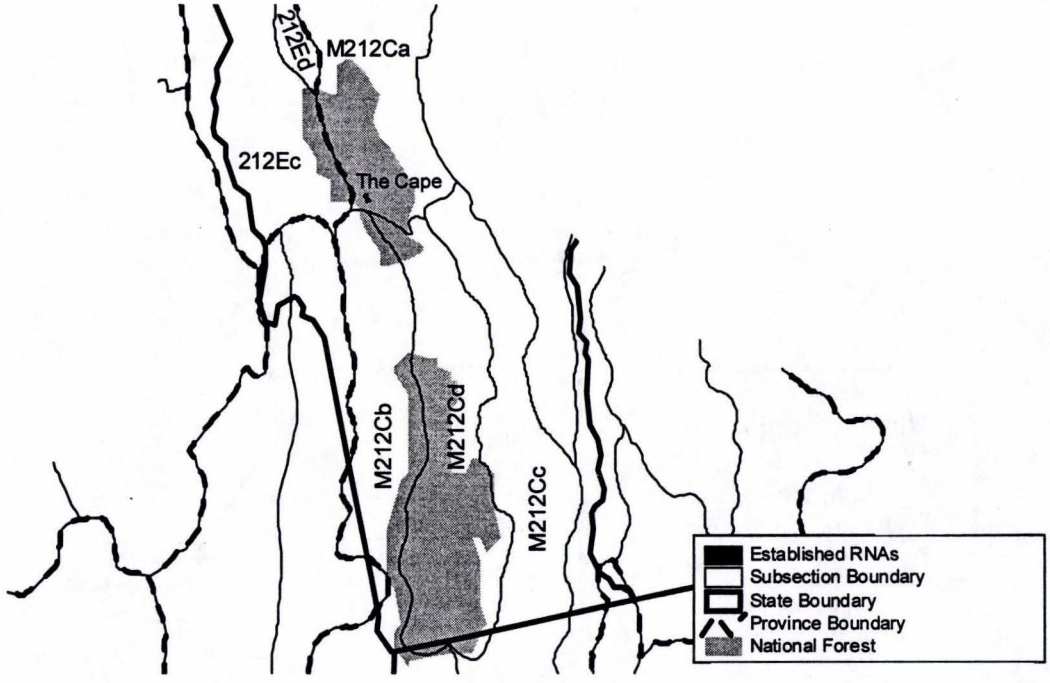
GREEN MOUNTAIN AND FINGER LAKES FIGURES

Green Mountain and Finger Lakes Figure 1. Location of the Green Mountain and Finger Lakes National Forests



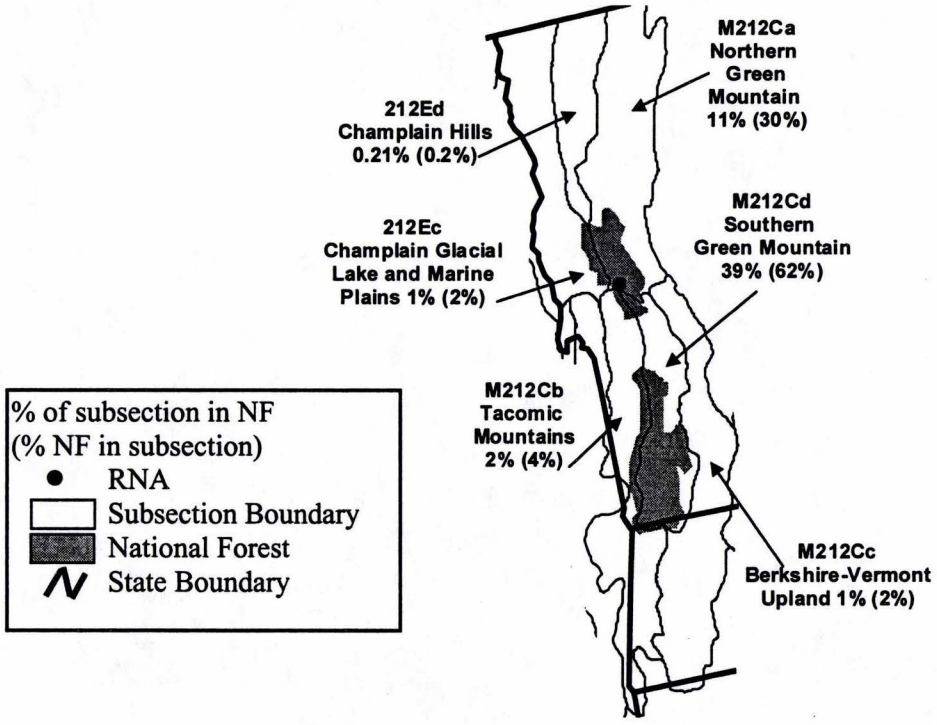
Green Mountain and Finger Lakes Figure 2. The Green Mountain National Forest with established RNAs and subsections

A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



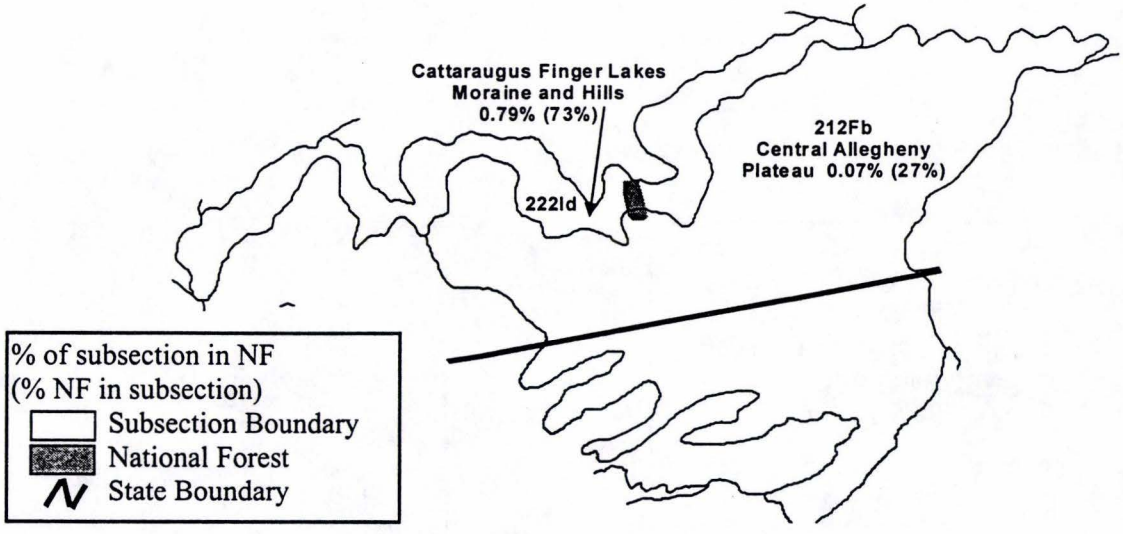
Green Mountain/Finger Lakes Figure 3a. Green Mountain National Forest in relation to subsections.

The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percent of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percentage of national forest land (managed) in the Subsection.

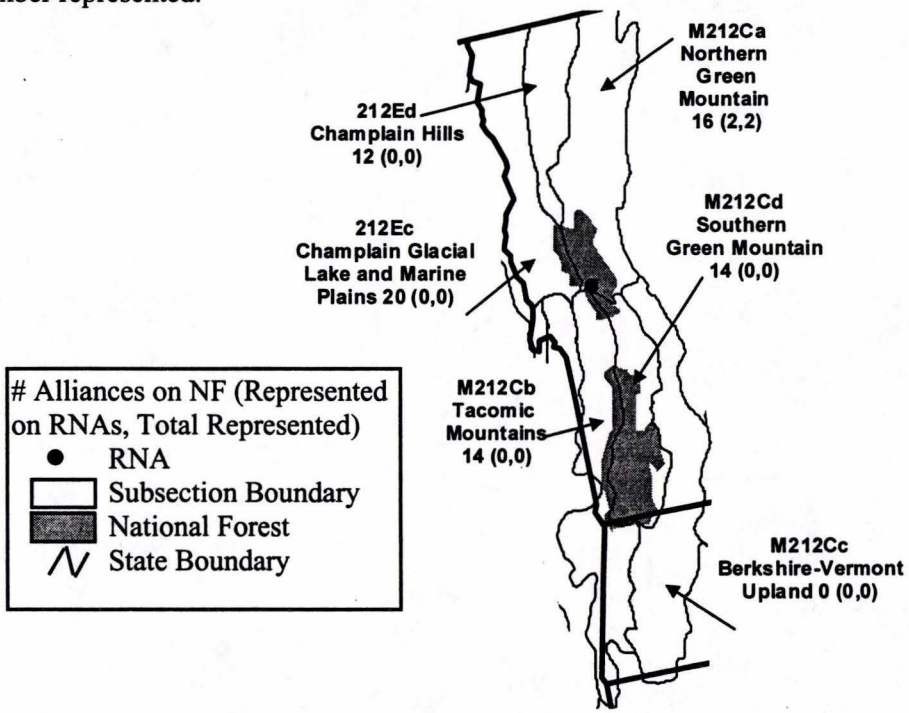


Green Mountain and Finger Lakes Figure 3b. Finger Lakes National Forest in relation to subsections.

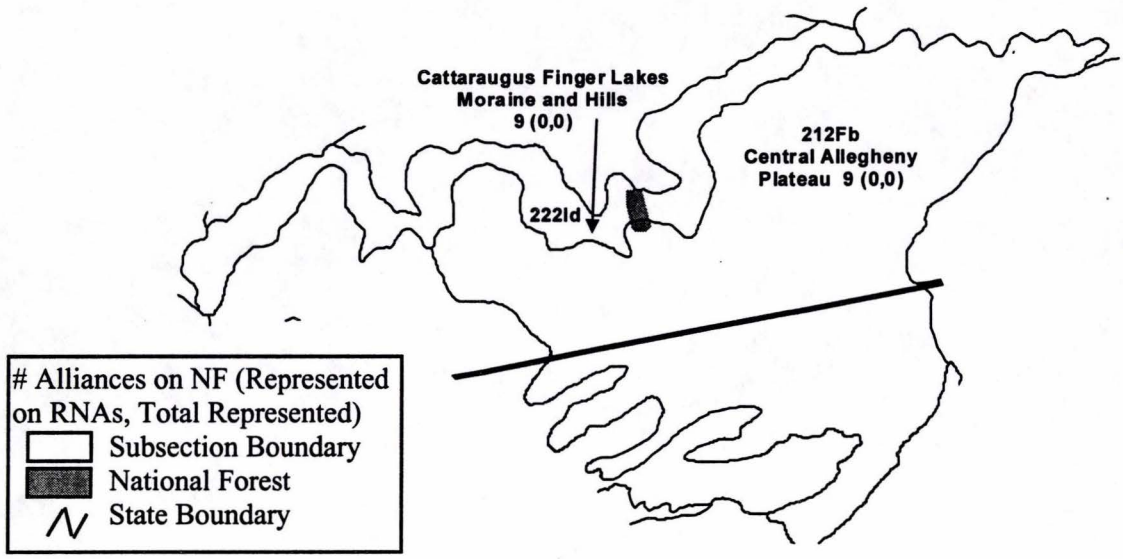
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percent of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percent of National Forest land (managed) in the Subsection.



Green Mountain and Finger Lakes Figure 4a. Alliance representation on subsections of the Green Mountain National Forest. The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on national forest land, and in parentheses, the number of these represented by RNAs only followed by the total number represented.



Green Mountain and Finger Lakes Figure 4b. Alliance representation on subsections of the Finger Lakes National Forest. The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on
n s, the number of
t



GREEN MOUNTAIN AND FINGER LAKES APPENDICES

Green Mountain and Finger Lakes Appendix A1. Subsections of the Green Mountain National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Green Mountain and Finger Lakes Tables 5a and 5b for information on the format of this table. The difference between the tables is that Green Mountain and Finger Lakes Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Green Mountain and Finger Lakes Tables 5a and 5b, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Green Mountain NF

Community Pattern **Alliances not Reported on NF Land**	M212Cd (SGM)		M212Ca (NGM)		M212Cb (TM)		M212Cc (BV)		212Ec (CG)		212Ed (CH)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Red Spruce - Balsam Fir Forest Alliance	▪		▪				▪					
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Northern White Cedar Forest Alliance									▪			
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance	▪						▪		▪		▪	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	▪						▪		▪			
Eastern Cottonwood Temporarily Flooded Forest Alliance	▪		▪				▪		▪		▫	
Red Maple Seasonally Flooded Woodland Alliance	▪						▪		▫		▫	
Black Spruce Saturated Forest Alliance	▪		▪				▪		▪			
Red spruce - Balsam Fir Saturated Forest Alliance	▪		▪				▪		▫		▪	
Black Ash - Red Maple Saturated Forest Alliance	▪		▪				▪		▪		▫	
Black Spruce Saturated Woodland Alliance	▪		▪				▪		▪		▪	
Pitch Pine Woodland Alliance	▪						▪					
Black Spruce - Balsam Fir Shrubland Alliance	▫		▫									
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Black Oak - White Oak Forest Alliance	▪						▪		▪			
Sugar Maple - Chinquapin Oak Forest Alliance	▪						▪		▪		▪	
River Birch - (Sycamore) Temporarily Flooded Forest Alliance									▫			
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	▪		▪				▪		▪		▫	
Eastern Hemlock Saturated Forest Alliance	▪						▪		▪			

Community Pattern **Alliances not Reported on NF Land**	**Subsections of Green Mountain NF**					
	M212Cd (SGM)	**M212Ca (NGM)**	**M212Cb (TM)**	**M212Cc (BV)**	**212Ec (CG)**	**212Ed (CH)**
Red Maple - Black Gum Saturated Forest Alliance				▪	▪	▫
Northern White-cedar Woodland Alliance	▪	▪			▪	
Red Cedar - (Green Ash, Eastern Hop-Hornbeam) Woodland Alliance	▪			▪	▪	▫
American Basswood - White Ash Woodland Alliance	▪	▪		▫	▪	▪
Red Oak - Rock Chestnut Oak Woodland Alliance	▪	▪		▪		▫
Black Willow Temporarily Flooded Shrubland Alliance	▪	▪		▪	▪	▫
Buttonbush Semipermanently Flooded Shrubland Alliance	▪			▪	▫	▫
Highbush Blueberry Saturated Shrubland Alliance	▪	▪		▪		▪
Alpine Blueberry Dwarf-Shrubland Alliance	▪	▪		▪		
Sheep-Laurel - Labrador Tea Dwarf-shrubland Alliance		▪				
American Cranberry Saturated Dwarf-Shrubland Alliance	▪	▪		▪		
Black Crowberry Saturated Dwarf-shrubland Alliance		▪ (1)				
Huckleberry (Black, Dwarf) Saturated Dwarf-Shrubland Alliance	▪	▪		▪		
American Beachgrass Herbaceous Alliance					▪	
Tufted Bulrush Herbaceous Alliance		▪				
Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance				▪	▫	
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	▪	▫		▫	▪	▫
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance	▪				▪	
Golden-saxifrage Saturated Herbaceous Alliance	▫	▫				
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance	▫	▫		▫	▫	▫
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance	▫	▫		▫	▫	▫
Northern Sea Rocket Sparsely Vegetated Alliance					▪	

Green Mountain and Finger Lakes Appendix A2. Subsections of the Finger Lakes National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Green Mountain and Finger Lakes Table 5 for information on the format of this table. The difference between these two tables is that Green Mountain and Finger Lakes Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Green Mountain and Finger Lakes Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Finger Lakes NF

Community Pattern **Alliances not Reported on NF Land**	222Id (CF)		212Fb (CAP)	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**
White Pine Forest Alliance	▫		▫	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance			▪	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	▪		▪	
Black Spruce Saturated Forest Alliance	▫		▪	
Eastern Hemlock Saturated Forest Alliance	▪		▪	
Northern White Cedar Saturated Forest Alliance	▪		▪	
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance	▪		▪	
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance	▪		▪	
Black Oak - White Oak Forest Alliance			▪	
Eastern Cottonwood Temporarily Flooded Forest Alliance	▪		▪	
Red Maple Seasonally Flooded Woodland Alliance	▪		▪	
River Birch - (Sycamore) Temporarily Flooded Forest Alliance	▫		▪	
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	▪		▪	
Northern White Cedar - Red Maple Saturated Forest Alliance	▪			
Red spruce - Balsam Fir Saturated Forest Alliance			▪	
Red Spruce - Red Maple Saturated Forest Alliance	▪		▪	
Black Ash - Red Maple Saturated Forest Alliance	▪		▪	
Red Maple - Black Gum Saturated Forest Alliance			▪	

Subsections of Finger Lakes NF

Community Pattern **Alliances not Reported on NF Land**	222Id (CF)	212Fb (CAP)
Black Spruce Saturated Woodland Alliance	▪	▪
(Jack Pine, Red Pine) Woodland Alliance		▪
Pitch Pine Woodland Alliance		▫
Red Cedar - (Green Ash, Eastern Hop-Hornbeam) Woodland Alliance	▪	▪
Red Oak - Rock Chestnut Oak Woodland Alliance	▫	▪
Black Willow Temporarily Flooded Shrubland Alliance	▫	▪
Buttonbush Semipermanently Flooded Shrubland Alliance	▪	▪
River Birch Temporarily Flooded Shrubland Alliance		▪
Smooth Alder Temporarily Flooded Shrubland Alliance		▫
Highbush Blueberry Saturated Shrubland Alliance	▫	▪
Leatherleaf / Wiregrass Sedge Saturated Shrub Herbaceous Alliance		▪
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪	▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	▪	▪
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▫	▫
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▫	▫
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance	▫	▫
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance		▪
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance	▫	▫
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance	▫	▫

Green Mountain and Finger Lakes Appendix B1. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Green Mountain National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not an ecosystem to represent), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank?
Subsection* M212Cd. *Southern Green Mountain					
Subsection* M212Ca. *Northern Green Mountain					
Matrix Alliances					
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	The Cape		174	C A? B	B
Large Patch Alliances					
Sugar Maple - White Ash - American Basswood Forest Alliance	The Cape		100	C A+ B	B
Small Patch Alliances					
Black Crowberry Saturated Dwarf-Shrubland Alliance		Mount Mansfield	1	C C B	BC
Leatherleaf Saturated Dwarf-Shrubland Alliance		Morristown Bog Natural Area		U E BC	U
		Northern Green Mountain (M212Ca) Total:	275		
Subsection* M212Cb. *Taconic Mountains					
Subsection* M212Cc. *Berkshire-Vermont Upland					
Subsection* 212Ec. *Champlain Glacial Lake and Marine Plains					
Subsection* 212Ed. *Champlain Hills					
		Grand Total:	275		

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.

* Rank assignment is uncertain.

Green Mountain and Finger Lakes Appendix B2. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Finger Lakes National Forest.

There are no RNAs on the Finger Lakes National Forest, and we were unable to identify RNA-equivalents. See Green Mountain and Finger Lakes Appendix C for a list of alliances on Special Areas that are also candidate RNAs.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank?

Subsection 222Id. *Cattaraugus Finger Lakes Moraine and Hills*

no data

Subsection 212Fb. *Central Allegheny Plateau*

no data

Green Mountain and Finger Lakes Appendix C. Communities occurring on Special Areas within the Finger Lakes National Forest.

These Special Areas are also candidate RNAs. If they are established as RNAs, or if it is determined that they meet RNA-equivalency criteria as Special Areas, then the alliances they contain may (if ranked B or higher) be represented in the subsection in which they occur.

Subsection 222Id (Cattaraugus Finger Lakes Moraine and Hills)

Special Area	Alliance	Association
Butcher Hill *(27 acres)*	*Semi-natural shrub types only*	
Mill Creek Ravine *(31 acres)*	Eastern Hemlock – Yellow Birch Forest Alliance	• Eastern Hemlock - Yellow Birch Lower New England, Northern Piedmont Forest (CEGL006109)
	Eastern Red-cedar Forest Alliance	• Eastern Red-Cedar Forest (CEGL007124)
Potomac Road Shrub Opening *(54 acres)*	*Semi-natural shrub types only*	
Sawmill Ravine *(139 acres)*	Eastern Hemlock – Yellow Birch Forest Alliance	• Eastern Hemlock - Yellow Birch Lower New England, Northern Piedmont Forest (CEGL006109)
	Red Oak - Sugar Maple - (White Oak) Forest Alliance	• Red Oak - Sugar Maple / Flowering Maple - Beaked Hazelnut Forest (CEGL006173)
Townsend Road Oak Woods *(24 acres)*	Eastern Red-cedar Forest Alliance	• Eastern Red-Cedar Forest (CEGL007124)
	White Oak - (Red Oak, Hickory species) Forest Alliance	• White Oak - Red Oak - Shagbark Hickory Forest (CEGL002068)

Subsection 212Fb (Central Allegheny Plateau)

Special Area	Alliance	Association
Blueberry Patch *(119 acres)*	Red Oak - Sugar Maple - (White Oak) Forest Alliance	• Red Oak – Red Maple / Trout-Lily Forest (CEGL002462) • Red Oak – Sugar Maple / Flowering Maple – Beaked Hazelnut Forest (CEGL006173)
Hector Oak Woods *(327 acres)*	Eastern Hemlock – Yellow Birch Forest Alliance	• Eastern Hemlock – Yellow Birch Lower New England, Northern Piedmont Forest (CEGL006109)
	Eastern Red-cedar Forest Alliance	• Eastern Red-Cedar Forest (CEGL007124)
	White Oak - (Red Oak, Hickory species) Forest Alliance	• White Oak – Red Oak – Shagbark Hickory Forest (CEGL002068)
	White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	• White Pine - (Red Oak, Black Oak) – American Beech Forest (CEGL006293)
Potomac Creek Woods *(142 acres)*	Eastern Hemlock – Yellow Birch Forest Alliance	• Eastern Hemlock – Yellow Birch Lower New England, Northern Piedmont Forest (CEGL006109)
	White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	• White Pine - (Red Oak, Black Oak) – American Beech Forest (CEGL006293)

IX. E. Hiawatha National Forest RNA Assessment

HIAWATHA SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Hiawatha National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Hiawatha National Forest lands. The Hiawatha National Forest occupies portions of 10 subsections. One of these subsections is also occupied by the Chequamegon-Nicolet National Forest. The Hiawatha shares with the Chequamegon-Nicolet and with other conservation partners the opportunity to represent the ecosystems found in this subsection.

Thirty-eight alliances occur on Hiawatha lands, with the number of known alliances in each subsection ranging from 0[9] to 31. There are 114 alliance-subsection combinations on Hiawatha lands. Based on the draft framework of representation, these combinations are the ecosystems to represent for the Hiawatha National Forest. Of these alliance-subsection combinations, 11 also occur and could be represented on the Chequamegon-Nicolet National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection, to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Five of the Hiawatha alliance-subsection combinations (ecosystems) are represented by the 3 currently established Hiawatha RNAs.

Existing **RNA-equivalents** in the 10 subsections include:

- 15 Michigan Natural Areas,
- 24 Wisconsin State Natural Areas, and
- 10 preserves of The Nature Conservancy.

These 49 RNA-equivalents, along with the 3 RNAs, currently represent 29 (25%) of the Hiawatha alliance-subsection combinations (ecosystems). The number of represented alliance-subsection combinations is possibly larger, as we were unable to confidently identify alliances for many RNA-equivalents. Resolving these questions could quickly reduce the number of unrepresented ecosystems.

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[9] Two subsections have no alliance information because the National Forest occupies only a few small islands in these subsections, comprising less than 0.1% of the National Forest and less than 0.01% of each subsection. These subsections are primarily aquatic.

UNREPRESENTED ECOSYSTEMS

The Hiawatha National Forest has 85 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing RNAs on the Hiawatha and Chequamegon-Nicolet National Forests, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Hiawatha are:

- Seney Sand Lake Plain (212Hh),
- Grand Marais Sand End Moraine and Outwash (212Hi), and
- St. Ignace Lake Plain (212Hj).

The Hiawatha has high prominence (> 10%) in these subsections, and little of the biological diversity (fewer than 33% of the alliances) is represented in each.

Medium-priority subsections are Door and Escanaba Peninsulas and Lake Plains (212He), and Rudyard Clay Lake Plain (212Hk). Hiawatha National Forest prominence in these subsections is greater than 5%, and fewer than 50% of the alliances are represented in these subsections.

Low-priority subsections are Gwinn-Deerton Outwash and Sand Ridges (212Ha), West Green Bay Till Plain (212Hb), Lake Huron and Islands (212Pa), Green Bay (212Ob), and Lake Superior and Islands (212Ia), because Hiawatha prominence is less than 5% in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there are 10 **high-priority alliances** (of 36 Hiawatha alliances). These may be high-priority in each subsection in which they occur. Seven are not represented in *any* subsection in which they occur on Hiawatha land:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

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IX.E.1. INTRODUCTION

The Hiawatha National Forest is located in the Upper Peninsula of Michigan (Hiawatha Figure 1). The proclamation boundaries contain 1,294,642 acres, with 894,784 acres (69%) of this land currently (FY97) managed by the Hiawatha National Forest.

The Chequamegon-Nicolet National Forest shares a subsection with the Hiawatha. Therefore the completion of a representative RNA network for the Hiawatha is linked to the work of the Chequamegon-Nicolet National Forest.

The Hiawatha National Forest occurs entirely in Province 212 (Laurentian Mixed Forest Province). Appendix VIII lists the other national forests in this Province. The Hiawatha National Forest can work with these national forests to evaluate province-wide representation and establish priorities for the Province.

IX.E.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Hiawatha.

IX.E.2.a. Subsections

Jan Schultz (RNA Coordinator) provided us with a list of subsections for the Hiawatha National Forest. Overlaying of a national digital copy of national forest proclamation boundaries (a sample cover of 1972 data that comes with ArcInfo) on the digital subsection map of Keys *et al.* (1995) revealed an additional 3 subsections. These are Great Lakes subsections: 212Pa (Lake Huron and Islands), 212Ia (Lake Superior and Islands), and 212Ob (Green Bay). The designation of these subsections is such that any islands in these lakes are considered part of the lake subsection. Therefore Round Island and Government Island are in Subsection 212Pa, Grand Island is in Subsection 212Ia, and St. Vital Island is in Subsection 212Ob.

We also used these digital maps to determine the amount of land in each subsection within Hiawatha proclamation boundaries. We multiplied these values by 69%, which is the fraction of ownership to proclamation acres for the entire Hiawatha National Forest (FY97), to estimate ownership acreage within each subsection. In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of Hiawatha National Forest land (ownership) in each subsection, and the percent of each subsection with Hiawatha National Forest land (ownership).

On the one subsection that the Hiawatha shares with the Chequamegon-Nicolet, we added the additional national forest acres to the Hiawatha acres to calculate the percent of total national forest land in each subsection and the percent of each subsection managed by the national forest. Ownership acreage by subsection for the Chequamegon-Nicolet National Forest was calculated using the same method.

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service (or a particular National Forest) in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence of Hiawatha land in each subsection. If the Chequamegon-Nicolet and Hiawatha National Forests work together to represent ecosystems in the shared subsections, it may be useful to consider the prominence of total national forest land in these subsections.

The percent of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.E.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Michigan, we used information provided by state Heritage and national forest ecologists. They listed alliances that occur in each subsection with national forest land, and those that occur on national forest land in the subsection. (The alliances which occur on Forest Service lands are the focus of the RNA assessment.) Jan Schultz, ecologist and RNA Coordinator for the Hiawatha National Forest, used the Forest Service timber databases (Combined Data System) to aid her work.

In January 1998, associations (one level below alliance) were assigned to each community occurrence recorded in the Michigan Natural Heritage Program database. We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land. These data provided us with additional alliances in some subsections; the alliance lists have not been reviewed since these additions.

Alliance distributions in the Wisconsin portions of Michigan subsections came from the representative RNA pilot studies conducted in 1994 for both the Chequamegon and Nicolet (see Section V.A.), additions by national forest and State Ecologists, and a review by the State Ecologist. They were later supplemented by Element Occurrence data from the Wisconsin Heritage database.

IX.E.2.c. Identifying RNA-equivalents

RNA-equivalents in Michigan were identified during discussions held by ecologists from the Michigan Natural Features Inventory, the Michigan Chapter of The Nature Conservancy, the Ottawa, Hiawatha, and Huron-Manistee National Forests, and the authors. RNA-equivalents in Wisconsin were identified during similar discussions with ecologists from the Wisconsin DNR and the Chequamegon-Nicolet National Forest. The RNA Committee of the Hiawatha National Forest can work with these and other partners to evaluate additional areas and designations for RNA-equivalency.

IX.E.2.d. Digitizing RNAs

The Hiawatha National Forest provided USGS 7.5 minute (1:24,000 scale) topographical maps with outlines of RNA boundaries. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Hiawatha RNAs (Hiawatha Figure 2) in the projection used by the Hiawatha (UTM 16 NAD 83), or a Lake States or Region-wide RNA cover at regional projections.

IX.E.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance.. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type. Our choices were reviewed by Pat Comer, then of Michigan Natural Features, who is familiar with Hiawatha RNAs.

To obtain alliance information for RNA-equivalents we contacted people familiar with Michigan Natural Areas, Wisconsin State Natural Areas, and Michigan and Wisconsin TNC preserves:

- Kim Herman of the Michigan Natural Features Inventory provided us with a list of Michigan Natural Areas, with total acreage and subsection for each area. We were unable to obtain community

information, except for the few sites with Element Occurrences (EOs) recorded in the Michigan Heritage database. In these cases the acres assigned to the type are the size of the EO, which may not be entirely contained by the Natural Area. Thus major information is lacking about these RNA-equivalents.

- Wisconsin Natural Heritage Program provided us with lists of communities for most Wisconsin State Natural Areas, which had been obtained through recent site surveys. The translation between the Wisconsin Heritage Program community types and alliances is not clean—many Heritage types correspond to multiple alliances—so there is low confidence for many of these assignments. Additional information for some sites came from the Wisconsin Heritage Program Element Occurrence database.
- Complete community information for Michigan TNC preserves was provided by Doug Pearsall of the Michigan Field Office of The Nature Conservancy.
- Nancy Braker and Jude McCall of the Wisconsin Field Office provided us with a list of Wisconsin TNC preserves and subsections, and a list of communities for 2 of these preserves. The communities were provided in the Wisconsin Heritage classification, so there are the same translation problems as for Wisconsin State Natural Areas. As no acreages were provided for these community occurrences, we could not rank them and therefore do not know if they represent the corresponding alliances. The occurrences are listed in Hiawatha Appendix B but do not appear in any other tables.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Hiawatha Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Hiawatha National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.E.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Hiawatha National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.E.3.a. Subsections on national forest land

The 10 subsections that occur on Hiawatha National Forest land are listed below (see also Hiawatha Table 4). These subsections are listed in order of *prominence*, the percent of the subsection on Hiawatha National Forest land.

- Seney Sand Lake Plain (212Hh)
- Grand Marais Sand End Moraine and Outwash (212Hi)
- St. Ignace Lake Plain (212Hj)
- Door and Escanaba Peninsulas and Lake Plains (212He)
- Rudyard Clay Lake Plain (212Hk)
- Gwinn-Deerton Outwash and Sand Ridges (212Ha)
- West Green Bay Till Plain (212Hb)*
- Lake Superior and Islands (212Ia)**
- Lake Huron and Islands (212Pa)**
- Green Bay (212Ob)**

*The Chequamegon-Nicolet also manages part of subsection 212Hb. Both national forests share the responsibility of representing the range of natural communities in this subsection.

**The designation of these subsections is such that any islands in these lakes are considered part of the lake subsection. Therefore Grand Island is in Subsection 212Ia and St. Vital Island is in Subsection 212Ob.

The majority of Hiawatha National Forest land (ownership) occurs on 2 subsections (Hiawatha Table 4, Hiawatha Figure 3): 212Hh (30%) and 212Hi (31%). In addition, large portions of these subsections are managed by the Hiawatha—approximately 27% of 212Hh and 24% of 212Hi—*i.e.*, the Hiawatha has high *prominence* of land coverage in these subsections. About 15% of Hiawatha land occurs on 212Hj and 16% on 212He, and the Hiawatha National Forest manages about 14% of each of these subsections.

The remaining 6 subsections each occupy less than 5% of Hiawatha land. Hiawatha manages 6% of 212Hk, but less than 5% of the other 5 subsections. Even when Chequamegon-Nicolet land in 212Hb is included, only 2% of the subsection is on national forest land.

IX.E.3.b. Natural communities within subsections

A total of 68 alliances are reported to occur within these 10 subsections. Of these, 44 are known to be on national forest land (Hiawatha Table 5, first column); the 24 alliances not reported to occur on national forest land are listed in Hiawatha Appendix A. Six of the "national forest alliances" have only been reported for the Chequamegon-Nicolet National Forest (Hiawatha Appendix D). While these alliances are not considered to be ecosystems to represent for the Hiawatha in this assessment, they should be checked for presence on Hiawatha land.

Of the 44 alliances occurring on national forest land, 11 are **matrix** alliances (see Hiawatha Table 5, first set of alliances), 20 are **large patch** (second set) and 13 are **small patch** (third set). (See "National Vegetation Classification" page 8-9). Of the 38 alliances reported on Hiawatha land, 11 are matrix, 16 are large patch, and 11 are small patch.

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on *Hiawatha* National Forest land within each subsection:

- 212Hh (Seney Sand Lake Plain): 17 alliances (4 matrix, 8 large patch, 5 small patch)
- 212Hi (Grand Marais): 15 alliances (4 matrix, 6 large patch, 5 small patch)
- 212Hj (St. Ignace Lake Plain): 31 alliances (9 matrix, 14 large patch, 8 small patch)
- 212He (Door and Escanaba): 19 alliances (4 matrix, 8 large patch, 7 small patch)
- 212Hk (Rudyard Clay Lake Plain): 6 alliances (3 matrix, 3 large patch)
- 212Ha (Gwinn-Deerton): 9 alliances (4 matrix, 3 large patch, 2 small patch)
- 212Hb (West Green Bay): 13 alliances (5 matrix, 7 large patch, 1 small patch)
  (An additional 13 alliances—3 matrix, 6 large patch, and 4 small patch—are reported for the Chequamegon-Nicolet in this subsection.)
- 212Ia (Lake Superior and Islands): 4 alliances (1 matrix, 3 small patch)
- 212Pa (Lake Huron and Islands): 0 alliances (primarily aquatic)
- 212Ob (Green Bay): 0 alliances (primarily aquatic)

There are a total of 114 subsection-alliance combinations on Hiawatha National Forest land. Hiawatha Table 5 shows the alliances that occur in each subsection. It identifies alliances on national forest land, but in shared subsections it does not distinguish alliances identified only for the Hiawatha from those identified only for the Chequamegon-Nicolet. (Alliances found only in the Chequamegon-Nicolet are listed in Hiawatha Appendix D.) Neither does the table distinguish alliances that occur on both Hiawatha and Chequamegon-Nicolet land from those reported exclusively for the Hiawatha.

IX.E.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents. The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Hiawatha Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Hiawatha Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

The Hiawatha National Forest has 3 established RNAs (Hiawatha Table 6) and 20 candidate RNAs (cRNAs). Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs of the Hiawatha National Forest (Hiawatha Figure 2) is available in the projection used by the Hiawatha National Forest (UTM 16 NAD 83) from the Regional RNA Coordinator. A Lake States national forests RNA cover is also available.

RNA-equivalents

Some subsections of the Hiawatha National Forest occur in both Wisconsin and Michigan. Therefore RNA-equivalents in both states are relevant. Chequamegon-Nicolet and Wisconsin Department of Natural Resources personnel have agreed that the following areas are RNA-equivalents (Hiawatha Table 2) in Wisconsin:

- Wisconsin State Natural Areas (SNAs), and
- all of The Nature Conservancy's (TNC's) preserves.

Hiawatha, Ottawa, and Huron-Manistee National Forest, Michigan Natural Features Inventory, and The Nature Conservancy personnel have agreed that the following areas are RNA-equivalents (Hiawatha Table 2) in Michigan:

- Michigan Natural Areas (SNAs) on state-owned land that are documented and secure, and
- all of The Nature Conservancy's (TNC's) preserves.

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Hiawatha Table 3, Hiawatha Appendix E). Hiawatha National Forest personnel can work with conservation partners to find additional RNA-equivalents. Certain portions of Wisconsin State Forests and Parks *may* meet the criteria for RNA-equivalency (Hiawatha Table 3).

In Wisconsin and Michigan, at present, no portions of State Wayside, or Wildlife Management Areas are RNA-equivalents. In Michigan no portions of State Forests or State Parks are RNA-equivalents. If the legal protection status (including management directives) of these areas is increased, then they could be reconsidered for RNA-equivalency.

Fifteen Michigan Natural Areas, 24 Wisconsin State Natural Areas, 6 Michigan TNC preserves, 3 Wisconsin TNC preserves, and 1 Minnesota TNC preserve serve as RNA-equivalents for the Hiawatha assessment (Hiawatha Tables 6, 7a).

We were unable to obtain community data for some RNA-equivalents, and for others our data are incomplete. As a result there is likely to be a higher number of represented ecosystems than indicated below.

Subsection 212Hh (Seney Sand Lake Plain)

Subsection 212Hh contains no RNAs or RNA-equivalents (Hiawatha Figure 3, Hiawatha Tables 6, 7a). Therefore, the 4 matrix, 8 large patch, and 5 small patch alliances in the subsection are unrepresented (Hiawatha Table 7b).

Subsection 212Hi (Grand Marais Sand End Moraine and Outwash)

Subsection 212Hi contains no RNAs, but does contain 8 Michigan Natural Areas, together covering 19,976 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Crisp Point (138)*
- Deer Park Site (60)*
- Marsh Lakes (46)*
- McMahon Lake Strangmoor (1,770)*
- Tahquamenon Falls-Betsy Lake (17,878)*
- Tahquamenon Island (3)*
- Vermillion Point (58)*
- Wagner Falls Scenic Site (23)*

and 2 TNC preserves, covering 3,119 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- McMahon Lake (2,919)
- Swamp Lakes (200).

Thus, 23,095 acres (2%) of the subsection are protected by RNA-equivalents (Hiawatha Table 7a).

Natural Communities (Alliances)

Of 15 alliances reported to be on national forest land in Subsection 212Hi, 4 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Hiawatha Table 5, column 212Hi; Hiawatha Table 7b; Hiawatha Figure 4). The 8 Michigan Natural Areas without community data may represent additional alliances.

Of 4 matrix alliances, 1 is represented; of 6 large patch alliances, 3 are represented; and none of the 5 small patch alliances are represented.

Subsection 212Hj (St. Ignace Lake Plain)

Subsection 212Hj contains 1 RNA, covering 2,065 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Horseshoe Bay (2,065).

The subsection also contains 3 Michigan Natural Areas, together covering 2,591 acres:

- Crow River Mouth (862)*
- Little Brevort Lake Scenic Site (542)*
- Seiner's Point (690)*

and 4 TNC preserves, covering 2,094 acres:

- Dudley Bay (747)
- Little LaSalle Island (61)
- Marquette Island (955)
- Maxton Plains (828).

Thus, 6,750 acres (0.7%) of the subsection are protected by RNAs and RNA-equivalents (Hiawatha Table 7a).

* Community data are unavailable at this time.

Natural Communities (Alliances)

Of 31 alliances reported to be on national forest land in Subsection 212Hj, 10 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Hiawatha Table 5, column 212Hj; Hiawatha Table 7b; Hiawatha Figure 4). The 3 Michigan Natural Areas without community data may represent additional alliances..

Of 9 matrix alliances, 3 are represented, of 14 large patch alliances, 4 are represented, and of the 8 small patch alliances, 3 are represented.

Subsection 212He (Door and Escanaba Peninsulas and Lake Plains)

Subsection 212He contains no RNAs, but does contain 1 Michigan Natural Area (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Point Detour (369)*

13 Wisconsin State Natural Areas:

- Baileys Harbor Boreal Forest and Wetlands
- Coffee Swamp
- Marshall's Point
- Mink River Estuary
- Moonlight Bay Bedrock Beach
- Mud Lake (1,060)
- Newport Conifer-Hardwoods (140)
- Peninsula Park Beech Forest (30)
- Peninsula Park White Cedar Forest (53)
- The Ridges Sanctuary (708)
- Toft Point (340)
- Two Creeks Buried Forest (12)
- Whitefish Dunes

and 3 Wisconsin TNC preserves:

- Jackson Harbor Ridges*
- Mink River Estuary (1,500)
- Shivering Sands Wetlands Complex (300).*

The 4,512 acres of RNA-equivalent land area shown in Hiawatha Table 7a is an underestimate because acreage information was unavailable for 6 Wisconsin SNAs and 1 TNC preserve. Using the underestimated figure, 0.4% of the subsection is protected by RNA-equivalents (Hiawatha Table 7a).

Natural Communities (Alliances)

Of 20 alliances reported to be on national forest land in Subsection 212He, 9 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Hiawatha Table 5, column 212He; Hiawatha Table 7b; Hiawatha Figure 4). The 1 Michigan Natural Area and 2 TNC preserves without community data may represent additional alliances.

Of 4 matrix alliances, 1 is represented, of 9 large patch alliances, 4 are represented, and of 7 small patch alliances, 4 are represented.

Subsection 212Hk (Rudyard Clay Lake Plain)

Subsection 212Hk contains no RNAs or RNA-equivalents (Hiawatha Figure 3, Hiawatha Tables 6, 7a). Therefore, the 3 matrix, 3 large patch alliances in the subsection are unrepresented (Hiawatha Table 7b).

* Community data are unavailable at this time.

Subsection 212Ha (Gwinn-Deerton Outwash and Sand Ridges)

Subsection 212Ha contains no RNAs, but does contain 1 Michigan Natural Area, covering 360 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Laughing Whitefish Falls Scenic Site

Thus, 360 acres (0.1%) of the subsection are protected by an RNA-equivalent (Hiawatha Table 7a).

Natural Communities (Alliances)

Of 4 matrix , 3 large patch, and 2 small patch alliances reported to be on national forest land in Subsection 212Ha, none are represented (Hiawatha Table 5, column 212Ha; Hiawatha Table 7b; Hiawatha Figure 4).

Subsection 212Hb (West Green Bay Till Plain)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can cooperate to represent the shared alliance-subsection combinations.

Subsection 212Hb contains 1 RNA, covering 233 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Dukes RNA

and 5 Wisconsin State Natural Areas:

- Hortonville Bog
- Mukwa Bottomland Forest
- Poppy's Rock (20)
- Shaky Lake
- Tellock's Hill Woods (32).

The 52 acres of RNA-equivalent land area shown in Hiawatha Table 7a is an underestimate because acreage information was unavailable for 3 Wisconsin SNAs. Using the underestimated figure, 285 acres (0.01%) of the subsection are protected by RNAs and RNA-equivalents (Hiawatha Table 7a).

Natural Communities (Alliances)

Of the 25 alliances reported to be on national forest land in Subsection 212Hb, 3 are currently represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Hiawatha Table 5, column 212Hb; Hiawatha Table 7b; Hiawatha Figure 4).

Thirteen unrepresented alliances were reported to occur only on the Chequamegon-Nicolet National Forest in this subsection (Hiawatha Appendix D). Unless it is determined that these alliances *do* occur on Hiawatha land in this subsection, they are not ecosystems to represent for the Hiawatha in 212Hb.

This leaves 12 alliances to be represented on the Hiawatha in this subsection. Of 5 **matrix** alliances, 1 is represented and, of 6 **large patch** alliances, 2 are represented. The single **small patch** alliance is not represented.

Two of the 4 unrepresented matrix alliances and the 1 unrepresented small patch alliance have low-quality occurrences on an RNA or RNA-equivalent due to their small sizes (Hiawatha Appendix B):

- Eastern Hemlock - Yellow Birch Forest Alliance (matrix--Dukes RNA)
- Eastern Hemlock Forest Alliance (matrix--Dukes RNA)
- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (small patch--Shaky Lake)

* Community data are unavailable at this time.

Subsection 212Ia (Lake Superior and Islands)

Subsection 212Ia contains 1 RNA, covering 59 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Grand Island RNA

2 Michigan Natural Areas, covering 439 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Little Presque Isle Natural Area*
- Little Presque Isle Wilderness Area*

4 Wisconsin State Natural Areas (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Apostle Islands Critical Species*
- Apostle Islands Maritime Cliffs
- Apostle Islands Maritime Forest
- Apostle Islands Sandscape

and 1 Minnesota TNC preserve, covering 146 acres (Hiawatha Tables 6, 7a):

- Susie Island

The 585 acres of RNA-equivalent land area shown in Hiawatha Table 7a is an underestimate because acreage information was unavailable for the 4 Wisconsin SNAs. Using the underestimated figure, 644 acres (0.003%) of the subsection are protected by RNAs and RNA-equivalents (Hiawatha Table 7a). This percentage would be much larger if the area of Lake Superior, which contains no alliances, were excluded.

Natural Communities (Alliances)

The list of alliances in Subsection 212Ia came from the Grand Island RNA, RNA-equivalents, and Element Occurrences in the Michigan Natural Heritage database, but it has not been supplemented by Hiawatha ecologists. As a result, the list is probably incomplete. Of the 4 alliances currently identified on national forest land (Grand Island), 3 are currently represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Hiawatha Table 5, column 212Ia; Hiawatha Table 7b; Hiawatha Figure 4).

The single **matrix** alliance is not represented, but the 2 **large patch** alliances and 1 **small patch** alliance are all represented.

The unrepresented matrix alliance occurs on Grand Island RNA, but has a low quality/viability rank due to its small size (Hiawatha Appendix B):

- Eastern Hemlock - Yellow Birch Forest Alliance (matrix--Grand Island RNA)

* Community data are unavailable at this time.

Subsection 212Pa (Lake Huron and Islands)

Subsection 212Pa contains no RNAs or RNA-equivalents.(Hiawatha Figure 3, Hiawatha Tables 6, 7a). No alliances have been identified on the 600 acres of Hiawatha land in this subsection (on Round Island and Government Island) because community data came only from Element Occurrences in the Michigan Natural Heritage database. The Hiawatha has not supplemented the list of alliances in this subsection. Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

Subsection 212Ob (Green Bay)

Subsection 212Ob contains no RNAs, but does contain 2 Wisconsin State Natural Areas, covering 42 acres (Hiawatha Figure 3, Hiawatha Tables 6, 7a):

- Jackson Harbor Ridges
- Sister Islands.

Thus, 0.004% of the subsection is protected by RNA-equivalents (Hiawatha Table 7a). This percentage would be much larger if the area of the Bay itself, which contains no alliances, were excluded. No alliances have been reported from the 40 acres of Hiawatha land in this subsection (on St. Vital Island) because community data came only from Wisconsin SNAs and Element Occurrences in the Michigan Natural Heritage database. The Hiawatha has not supplemented the list of alliances in this subsection. Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

IX.E.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Hiawatha National Forest. The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Hiawatha Table 5 by shaded cells which contain no number. Alliances that are not represented in any Hiawatha subsection (unrepresented Forest-wide) are listed in Hiawatha Appendix C.

Subsection	Dominance Percentage of Hiawatha NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Hiawatha NF land	Percentage of NF alliances represented	Proposed priority
212Hh. Seney Sand Lake Plain	30	0	27	0	high
212Hi. Grand Marais Sand End Moraine and Outwash	31	2	24	27	high
212Hj. St. Ignace Lake Plain	15	0.7	14.1	32	high
212He. Door and Escanaba Peninsulas and Lake Plains	16	0.4	14.0	47	med.
212Hk. Rudyard Clay Lake Plain	2.5	0	6	0	med.
212Ha. Gwinn-Deerton Outwash and Sand Ridges	0.46	0.1	1.14	0	low
212Hb. West Green Bay Till Plain	3.3	0.01	1.12 (2*)	25 (12*)	low
212Pa. Lake Huron and Islands	0.07	*?*	0.004	*?*	low
212Ob. Green Bay	0.004	0.004	0.0036	*?*	low
212Ia. Lake Superior and Islands	1.5	0.003	0.1	75*?*	low

*Value when Chequamegon-Nicolet lands and alliances are included.

Subsections 212Hh, 212Hi, and 212Hj have the highest proposed priority for finding additional representation. Subsection 212Hh has the greatest prominence of all subsections on the Hiawatha, and none of its alliances are currently represented, making it the highest priority. A large percentage of Subsection 212Hi is also on the Hiawatha, but more of its alliances are represented. The high prominence of Subsections 212Hj and 212He (although lower than 212Hh and 212Hi) indicates high priority, but nearly half the alliances reported on 212He are already represented, making it medium priority. Subsection 212Hk has lower prominence, but none of its alliances are represented, so it is also medium priority. The remaining subsections have varying proportions of representation, but all have very low prominence, making them low priority.

With the exception of Subsection 212Ia, this order of priority follows the order of prominence. With 75% representation, Subsection 212Ia falls below 212Pa and 212Ob despite somewhat higher prominence. The RNA committees of Hiawatha and Chequamegon-Nicolet can collaborate to increase representation in Subsections 212Hb, which is low priority. In terms of land area, the low-priority subsections (212Ha, 212Hb, 212Pa, 212Ob, and 212Ia) are of marginal prominence, but they should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

Subsection 212Hh (Seney Sand Lake and Plain)

None of the 17 alliances in this subsection are represented (Hiawatha Figure 4). The 4 matrix alliances may be the highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance.

Subsection 212Hi (Grand Marais Sand End Moraine and Outwash)

Of 15 alliances, 4 are represented, leaving 11 alliances (73%) in need of representation (Hiawatha Figure 4). The 3 unrepresented matrix alliances may be the highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Areas, for which we have no community data:

- Crisp Point
- Deer Park Site
- Marsh Lakes
- McMahon Lake Strangmoor
- Tahquamenon Falls-Betsy Lake
- Tahquamenon Island
- Vermillion Point
- Wagner Falls Scenic Site

Subsection 212Hj (St. Ignace Lake Plain)

Of 31 alliances, 10 are represented, leaving 21 alliances (68%) in need of representation (Hiawatha Figure 4). The 6 unrepresented matrix alliances may be the highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance.

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural areas, for which we have no community data:

- Crow River Mouth
- Little Brevort Lake Scenic Site
- Seiner's Point

Subsection 212He (Door and Escanaba Peninsulas and Lake Plains)

Of 19 alliances, 9 are represented, leaving 10 alliances (53%) in need of representation (Hiawatha Figure 4). The 3 unrepresented matrix alliances may be the highest priority for RNA establishment:

- Jack Pine Forest Alliance

- Red Pine Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance.

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Area:

- Point Detour

and Wisconsin TNC preserves:

- Jackson Harbor Ridges
- Shivering Sands Wetlands Complex.

Subsection 212Hk (Rudyard Clay Lake Plain)

None of the 6 alliances are represented (Hiawatha Figure 4). The 3 matrix alliances may be the highest priority for RNA establishment:

- Eastern White Pine - Eastern Hemlock Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance.

Subsection 212Ha (Gwinn-Deerton Outwash and Sand Ridges)

None of the 9 alliances are represented (Hiawatha Figure 4). The 4 matrix alliances may be the highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance.

Subsection 212Hb (West Green Bay Till Plain)

Of 12 alliances, 3 are represented, leaving 9 alliances (75%) in need of representation (Hiawatha Figure 4). The 4 unrepresented matrix alliances may be the highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance* (Dukes RNA)
- Eastern Hemlock Forest Alliance* (Dukes RNA)
- Eastern White Pine - Eastern Hemlock Forest Alliance
- Red Pine Forest Alliance.

The 2 marked (*) alliances have low-quality occurrences on an RNA (Hiawatha Table 7b, Hiawatha Appendix B). The quality/viability of these occurrences should be verified. The one small patch alliance in this subsection has a low-quality occurrence on Shaky Lake Wisconsin SNA and its quality/viability should be verified:

- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance.

The Hiawatha can collaborate with the Chequamegon-Nicolet National Forest to represent alliances in this shared subsection. It is not necessary for both Forests to represent the same ecosystem. The 13 alliances reported only on Chequamegon-Nicolet land in this subsection (Hiawatha Appendix D) should be checked for presence on Hiawatha land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Pa (Lake Huron and Islands)

No alliances have been identified on the 600 acres of Hiawatha land in this subsection (on Round Island and Government Island) because community data came only from Element Occurrences in the Michigan Natural Heritage database. The Hiawatha has not supplemented the list of alliances in this subsection. No ecosystems can be represented until alliances have been identified on national forest land.

Subsection 212Ob (Green Bay)

No alliances have been reported from the 40 acres of Hiawatha land in this subsection (on St. Vital Island) because community data came only from Wisconsin SNAs and Element Occurrences in the Michigan Natural Heritage database. The Hiawatha has not supplemented the list of alliances in this subsection. No ecosystems can be represented until alliances have been identified on national forest land.

Subsection 212Ia (Lake Superior and Islands)

The Hiawatha has not supplemented the list of alliances identified in this subsection (on Grand Island). When more alliances have been identified, the number of unrepresented ecosystems may rise. Of the 4 known alliances, 3 are represented, leaving 1 alliance (25%) in need of representation (Hiawatha Figure 4). This matrix alliance may occur in the Apostle Islands Maritime Forest, and it has a low quality occurrence on Grand Island RNA (Hiawatha Table 7b, Hiawatha Appendix B):

- Eastern Hemlock - Yellow Birch Forest Alliance.

These occurrences should be verified. This alliance may also be represented if a high-quality occurrence is identified on either of the 2 Michigan Natural Areas for which we have no community data:

- Little Presque Isle Natural Area
- Little Presque Isle Wilderness Area.

HIAWATHA TABLES

Hiawatha Table 1. Established research natural areas (RNAs) of the Hiawatha National Forest

RNA	Acres	Subsection	Established
Dukes RNA	233	212Hb	1974
Grand Island RNA	59	212Ia	1977
Horseshoe Bay RNA	2,065	212Hj	1997

Hiawatha Table 2. Designations identified as RNA-equivalents for the Hiawatha National Forest

Protected Area Designation	Managed by
Michigan Natural Areas on State Owned Land that are Documented and Secure (MNAs)	Michigan Department of Natural Resources
Wisconsin State Natural Areas (SNAs)	Wisconsin Department of Natural Resources
The Nature Conservancy Preserves	The Nature Conservancy (private)

Hiawatha Table 3. Protected area designations not fully evaluated for RNA-equivalency*

Protected Area Designation	Managed by
Wilderness Areas National Scenic Rivers National Recreation Areas Ecological Study Areas	USDA Forest Service
Environmental Areas	Great Lakes Program
National Parks & Lakeshores	National Park Service (Pat Comer says *maybe*)
Private Nature Preserves	Private agencies other than The Nature Conservancy: Michigan Nature Association, Little Traverse Conservancy, Cranbrook Institute Nature Preserve
Research Natural Areas	US Fish & Wildlife Service Michigan Parks and Recreation
Quiet Areas	Michigan Forest Management Division
Wilderness State Park	Michigan Parks and Recreation
Critical Dune Area	Land & Water Management
University preserves	University of Michigan, private Universities

* See Hiawatha Appendix E for listing of some specific areas within these categories

Hiawatha Table 4. Subsections of the Hiawatha National Forest (NF), in order of prominence. The 2 "NF acres" columns show the approximate number of ownership acres of national forest (NF) land in each subsection. "Hiawatha NF acres" is Hiawatha National Forest land and "additional NF acres" is Chequamegon-Nicolet National Forest land in the same subsection. "Prominence" is the percentage of the subsection that is on national forest land: the first number is Hiawatha land only ("Hiawatha NF acres" / "Total subsection acres") and in parentheses is total NF land (("Hiawatha" + "additional" NF acres) / "Total subsection acres"). These percentages do not add to 100. "Dominance" is "Hiawatha NF acres" divided by "Hiawatha total ownership"; these percentages do add to 100, within rounding error. All values are approximate. See also Hiawatha Figure 3.

Subsection	Total subsection acres	Hiawatha NF acres[§]	Additional NF acres[§] (C-N)	Prominence Percentage of subsection on NF lands	Dominance Percentage of Hiawatha NF in subsection
212Hh—Seney Sand Lake Plain	1,009,059	269,897		27	30
212Hi—Grand Marais Sand End Moraine and Outwash	1,135,907	272,960		24	31
212Hj—St. Ignace Lake Plain	962,599	135,473		14.1	15
212He—Door and Escanaba Peninsulas and Lake Plains	1,043,508	146,076		14.0	16
212Hk—Rudyard Clay Lake Plain	366,787	22,811		6	2.5
212Ha—Gwinn-Deerton Outwash and Sand Ridges	354,458	4,028		1.14	0.46
212Hb*—West Green Bay Till Plain	2,671,452	29,931	23,585	1.12 (2)	3.3
212Ia—Lake Superior and Islands	20,846,013	13,568		0.1	1.5
212Pa—Lake Huron and Islands	14,939,627	600		0.004	0.07
212Ob—Green Bay	1,111,200	40		0.0036	0.004
Hiawatha National Forest total ownership:		894,784			

[§] These values were estimated by taking the proclamation acres for each subsection (from GIS analysis) and multiplying by the fraction of ownership to proclamation acres for the entire national forest (69% for Hiawatha.). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available.

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

Hiawatha Table 5. Subsections and alliances of the Hiawatha National Forest (NF) and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, and small patch), and subsections are sorted by NF prominence (see Hiawatha Table 4, fourth column). The presence of an alliance in a subsection and on National Forest land in the subsection is indicated by dots and shading, respectively. Alliances which occur in a subsection on Chequamegon-Nicolet land but not on Hiawatha land are included in this table but are not the responsibility of the Hiawatha NF (see Hiawatha Appendix C). The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) SSP= Seney Sand Lake Plain, GMS= Grand Marais Sand End Moraine and Outwash, SIP= St. Ignace Lake Plain, DEP= Door and Escanaba Peninsulas and Lake Plains, RCP= Rudyard Clay Lake Plain, GDO= Gwinn-Deerton Outwash and Sand Ridges, WGB= West Green Bay Till Plain, LSI= Lake Superior and Islands, LHI= Lake Huron and Islands, GB= Green Bay. For a list of alliances occurring in subsections of the Allegheny NF but not reported on NF land, see Hiawatha Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Maybe on NF land	◦ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Hiawatha NF--

Community Pattern **Alliances Reported on NF Land**	212Hh (SSP)		212Hl (GMS)		212Hj (SIP)		212He (DEP)		212Hk (RCP)		212Ha (GDO)		212Hb* (WGB)		212Ia‡ (LSI)		212Pa‡ (LHI)		212Ob‡ (GB)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance			▪		▪		(1) ▪				▪(1)		1 ▪		1 ▪		▪			
Eastern Hemlock Forest Alliance	▪												1 ▪		▪					
Eastern White Pine - Eastern Hemlock Forest Alliance	▪		▪		▪		(1) ▪		▪		▪		▪							
Jack Pine Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪					
Red Pine Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪					
White Pine Forest Alliance	▪		(1) ▪		▪		▪				▪		▪		▪					
White Spruce - Balsam Fir - Aspen Forest Alliance			(1) ▪		1 ▪		▫								(2) ▪(1)				▪(1)	

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

‡ We were unable to obtain data about alliances on national forest land in these Great Lakes subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus the RNA in 212Ia and some RNA-equivalents in 212Ia and 212Ob. We were unable to identify RNA-equivalents for 212Pa.

Community Pattern **Alliances Reported on NF Land**	--Subsections of Hiawatha NF-- 212Hh (SSP)	212Hi (GMS)	212Hj (SIP)	212He (DEP)	212Hk (RCP)	212Ha (GDO)	212Hb* (WGB)	212Ia‡ (LSI)	212Pa‡ (LHI)	212Ob‡ (GB)
White Spruce - Balsam Fir Forest Alliance	▪	▪	▪	▪	▪	▪	▪			
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		(1) ▪	(1) ▪ 1	(1) ▪	▪	▪	1 ▪			
Quaking Aspen - Paper Birch Forest Alliance	▪	▪	(1) ▪ 1	▪	▪	▪	▪			
Jack Pine - (Red Pine) Wooded Herbaceous Alliance			▪	▪	▪		▪	▪		▪
Large Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Jack Pine - Oak (Northern Pin, Black) Forest Alliance		▪		▪			▪			
Black Oak - Northern Pin Oak Forest Alliance							▪			
Silver Maple Temporarily Flooded Forest Alliance				▪			▪			
Black Spruce - Tamarack Saturated Forest Alliance	▪		▪							
Black Spruce Saturated Forest Alliance	▪	(1) ▪	▪	▪	▪	▪	▪	(1) ▪		
Northern White Cedar - Red Maple Saturated Forest Alliance	▪	▪	(1) ▪	▪	▪	▪	▪			
Northern White Cedar Saturated Forest Alliance	▪	(1) ▪	(3) ▪ (1)	(3) ▪	▪	▪	1 ▪		▪	
Black Ash - Red Maple Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪			
Tamarack Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪			
Black Spruce Saturated Woodland Alliance	▪	▪	▪				▪			
Speckled Alder Seasonally Flooded Shrubland Alliance	▪	▪	▪	(2) ▪ (1)	▪	▪	▪			
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance	▪	(1) ▪	▪	▪	▪	▪	▪			

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

‡ We were unable to obtain data about alliances on national forest land in these Great Lakes subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus the RNA in 212Ia and some RNA-equivalents in 212Ia and 212Ob. We were unable to identify RNA-equivalents for 212Pa.

Community Pattern **Alliances Reported on NF Land**	--Subsections of Hiawatha NF-- 212Hh (SSP)	212Hi (GMS)	212Hj (SIP)	212He (DEP)	212Hk (RCP)	212Ha (GDO)	212Hb* (WGB)	212Ia‡ (LSI)	212Pa‡ (LHI)	212Ob‡ (GB)
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪	▪	▪	(1) ▪	▪	▪	(1) ▪	(1) ▪	▪	
American Beachgrass Herbaceous Alliance		▪	▪	(1) ▪ (1)				▪	▪	▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance			▪							
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪	▪	(2) ▪	(1) ▪	▪	▪	▪	▪	▪	▪
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	▪	(1) ▪	▪							
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		▪	▪	▪			▪			
Herbaceous Dunes Sparse Vegetation			▪	(1) ▪				▫		▫
Northern White Cedar Complex			1 ▪	▪						

Small Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Eastern Hemlock Saturated Forest Alliance	▪									▪		▪	1	▪				
(Jack Pine, Red Pine) Woodland Alliance			▪				▪					▪						
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	▪		▪		▪		(1) ▪					▪	(1)					
Bog Birch - (Willow) Saturated Shrubland Alliance	▪				▪		▪					▫						
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance	▪		▪		(2) ▪		(3) ▪	(1)	▪		▪							
Wiregrass Sedge Saturated Herbaceous Alliance	▪		(1) ▪		(1) ▪		▪				(1) ▪							
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪		▪		▪		▪		▪		▪							
Open Bluff/Cliff Sparse Vegetation	▪		▪		▪		(1) ▪				▪		(1) ▪		▪		▪	

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

‡ We were unable to obtain data about alliances on national forest land in these Great Lakes subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus the RNA in 212Ia and some RNA-equivalents in 212Ia and 212Ob. We were unable to identify RNA-equivalents for 212Pa.

Community Pattern **Alliances Reported on NF Land**	--Subsections of Hiawatha NF--									
	212Hh (SSP)	212Hl (GMS)	212Hj (SIP)	212He (DEP)	212Hk (RCP)	212Ha (GDO)	212Hb* (WGB)	212Ia‡ (LSI)	212Pa‡ (LHI)	212Ob‡ (GB)
Open Pavement Sparse Vegetation		▪	▪	▪		▪	▪	(1) ▪	▪	▪
Cobble/Gravel Shore Sparse Vegetation	▪	▪	1 ▪	▪	▪	▪	▪		▪	(1) ▪
Inland Strand Beach Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪			
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation			▪							
Northern Sea Rocket Sparsely Vegetated Alliance		▪	▪	(2) ▪ (1)				(1) ▪		(1) ▪

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

‡ We were unable to obtain data about alliances on national forest land in these Great Lakes subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus the RNA in 212Ia and some RNA-equivalents in 212Ia and 212Ob. We were unable to identify RNA-equivalents for 212Pa.

Hiawatha Table 6. RNAs and RNA-equivalents (with acres) of the Hiawatha National Forest. Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection to that of an RNA.

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)	
		Michigan Natural Area or Wisconsin SNA[§]	TNC Preserve in MI, WI[§], or MN[£]
212Ha		Laughing Whitefish Falls Scenic Site (360)	
212Hb*	Dukes (233)	Hortonville Bog[§] Mukwa Bottomland Forest[§] Poppy's Rock (20)[§] Shaky Lake[§] Tellock's Hill Woods (32)[§]	
212He		Baileys Harbor Boreal Forest and Wetlands[§] Coffee Swamp[§] Marshall's Point[§] Mink River Estuary[§] Moonlight Bay Bedrock Beach[§] Mud Lake[§] (1,060) Newport Conifer-Hardwoods[§] (140) Peninsula Park Beech Forest[§] (30) Peninsula Park White Cedar Forest[§] (53) Point Detour[+] (369) The Ridges Sanctuary[§] (708) Toft Point[§] (340) Two Creeks Buried Forest[§] (12) Whitefish Dunes[§]	Jackson Harbor Ridges[§] Mink River Estuary[§] (1,500) Shivering Sands Wetlands Complex[§] (300)
212Hh			
212Hi		Crisp Point (138)[+] Deer Park Site (60)[+] Marsh Lakes (46)[+] McMahon Lake Strangmoor (1,770)[+] Tahquamenon Falls-Betsy Lake (17,878)[+] Tahquamenon Island (3)[+] Vermilion Point (58)[+] Wagner Falls Scenic Site (23)[+]	McMahon Lake (2,919) Swamp Lakes (200)
212Hj	Horseshoe Bay (2,065)	Crow River Mouth (862)[+] Little Brevort Lake Scenic Site (542)[+] Seiner's Point (690)[+]	Dudley Bay (747) Little Lasalle Island (61) Marquette Island (955) Maxton Plains (828)
212Hk			
212Ia	Grand Island (59)	Apostle Islands Critical Species[§] Apostle Islands Maritime Cliffs[§] Apostle Islands Maritime Forest[§] Apostle Islands Sandscape[§] Little Presque Isle Natural Area (430)[+] Little Presque Isle Wilderness Area (9)[+]	Susie Island (146)[£]
212Ob		Jackson Harbor Ridges[§] (27) Sister Islands[§] (15)	

*The Chequamegon-Nicolet National Forest also occurs in this subsection.
[§]Wisconsin
[£]Minnesota
[+]We were unable to obtain community data for this area.

Hiawatha Table 7. Summary of subsection representation on the Hiawatha National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect.
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Hh. Seney Sand Lake Plain					0
212Hi. Grand Marais Sand End Moraine and Outwash		10		23,095	23,095 *2%*
212Hj. St. Ignace Lake Plain	1	7	2,065	4,685	6,750 *<1%*
212He. Door and Escanaba Peninsulas and Lake Plains		17		4,512	4,512 *<1%*
212Hk. Rudyard Clay Lake Plain					0
212Ha. Gwinn-Deerton Outwash and Sand Ridges		1		360	360 *<1%*
212Hb. West Green Bay Till Plain	1	5	233	52	285 *<1%*
212Ia. Lake Superior and Islands	1	7	59	585	644 *<1%*
212Pa. Lake Huron and Islands					*?*
212Ob. Green Bay		2		42	42 *<1%*
TOTAL	3	49	2,357	33,331	35,688 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq). Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *? = unknown*

Subsection	# Alliances on NF land[§]	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212Hh. Seney Sand Lake Plain	17			0	
212Hi. Grand Marais Sand End Moraine and Outwash	15		4 *27%*	4 *27%*	
212Hj. St. Ignace Lake Plain	31	3 *10%*	7 *23%*	10 *32%*	
212He. Door and Escanaba Peninsulas and Lake Plains	20		9 *45%*	9 *45%*	
212Hk. Rudyard Clay Lake Plain	6			0	
212Ha. Gwinn-Deerton Outwash and Sand Ridges	9			0	
212Hb. West Green Bay Till Plain	25	2 *8%*	1 *4%*	3 *12%*	3
212Ia. Lake Superior and Islands	4 *(+?)*	1 *25%*	2 *50%*	3*?* *75%?*	1
212Pa. Lake Huron and Islands	*?*			*?*	
212Ob. Green Bay	*?*			*?*	

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.

**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

[§] This total includes alliances reported only on Chequamegon-Nicolet land in the subsection.

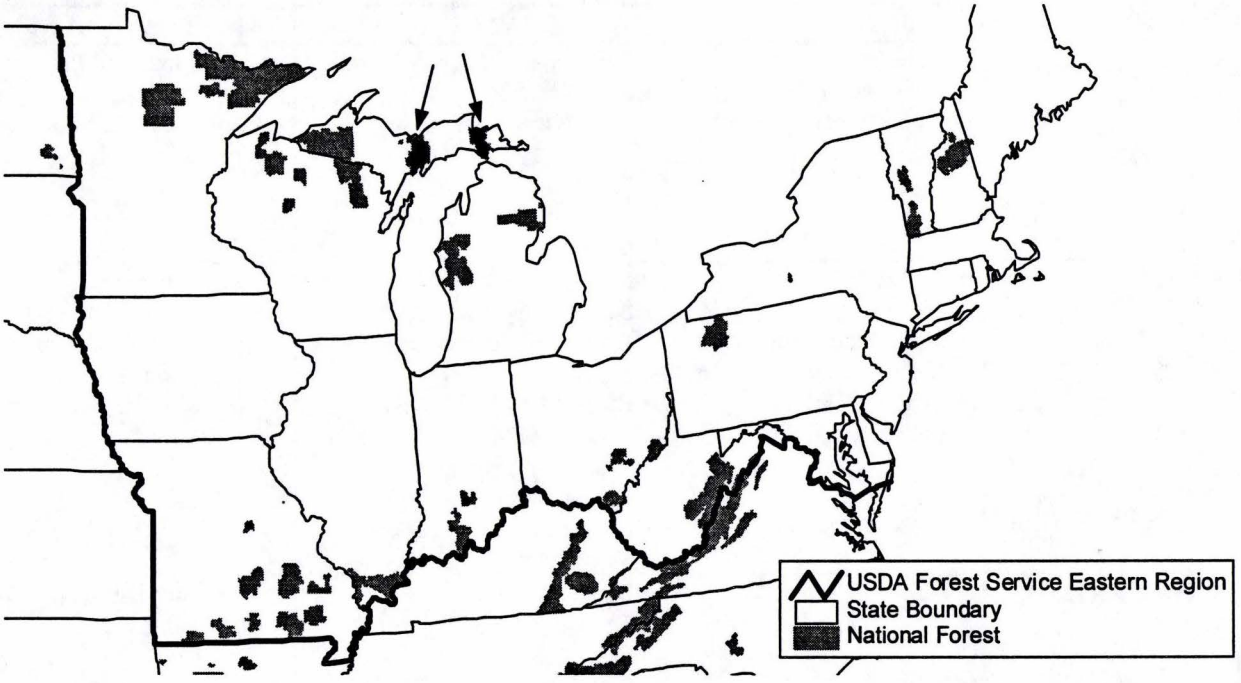
Hiawatha Table 8. Alliances of the Hiawatha National Forest arranged by community pattern and community distribution

COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	• Red Pine Forest • Jack Pine - (Red Pine) Wooded Herbaceous	• Jack Pine - Oak (Northern Pin, Black) Forest* • Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland • Northern White Cedar Complex	• (Jack Pine, Red Pine) Woodland • Cobble/Gravel Shore Sparse Vegetation
LIMITED	• Eastern White Pine - Eastern Hemlock Forest • White Pine Forest • Eastern Hemlock Forest • Eastern Hemlock - Yellow Birch Forest	• Northern White Cedar Saturated Forest • Black Oak - Northern Pin Oak Forest* • Black Ash - Red Maple Saturated Forest* • American Beachgrass Herbaceous • Herbaceous Dunes Sparse Vegetation	• Eastern Hemlock Saturated Forest • Open Pavement Sparse Vegetation • Inland Strand Beach Sparse Vegetation*
WIDESPREAD	• Jack Pine Forest • White Spruce - Balsam Fir Forest • Sugar Maple - Yellow Birch - (American Beech) Forest • Quaking Aspen - Paper Birch Forest • White Spruce - Balsam Fir - Aspen Forest	• Black Spruce Saturated Forest • Tamarack Saturated Forest • Black Spruce - Tamarack Saturated Forest • Black Spruce Saturated Woodland • Speckled Alder Seasonally Flooded Shrubland* • Leatherleaf Saturated Dwarf-Shrubland • Canada Bluejoint Seasonally Flooded Herbaceous • Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous • Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous • Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous	• Red Osier Dogwood - Willow Seasonally Flooded Shrubland • Bog Birch - (Willow) Saturated Shrubland • Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous • Wiregrass Sedge Saturated Herbaceous • Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous* • Open Bluff/Cliff Sparse Vegetation
PERIPHERAL		• Silver Maple Temporarily Flooded Forest	• Red Maple - Green Ash Seasonally Flooded Forest • Northern Sea-rocket Sparse Vegetation • Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation

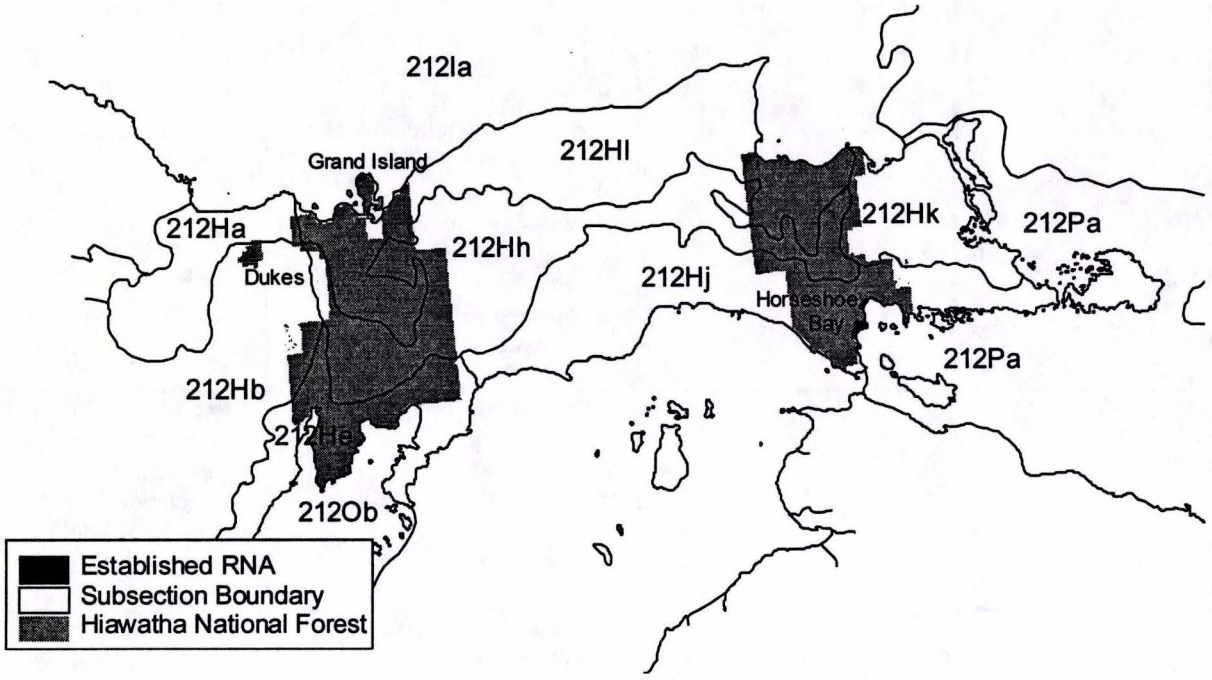
*Not reported to occur on Hiawatha National Forest land, but reported to occur on Chequamegon-Nicolet land in subsection 212Hb. These should be checked for occurrence on Hiawatha land. See Hiawatha Appendix D.

HIAWATHA FIGURES

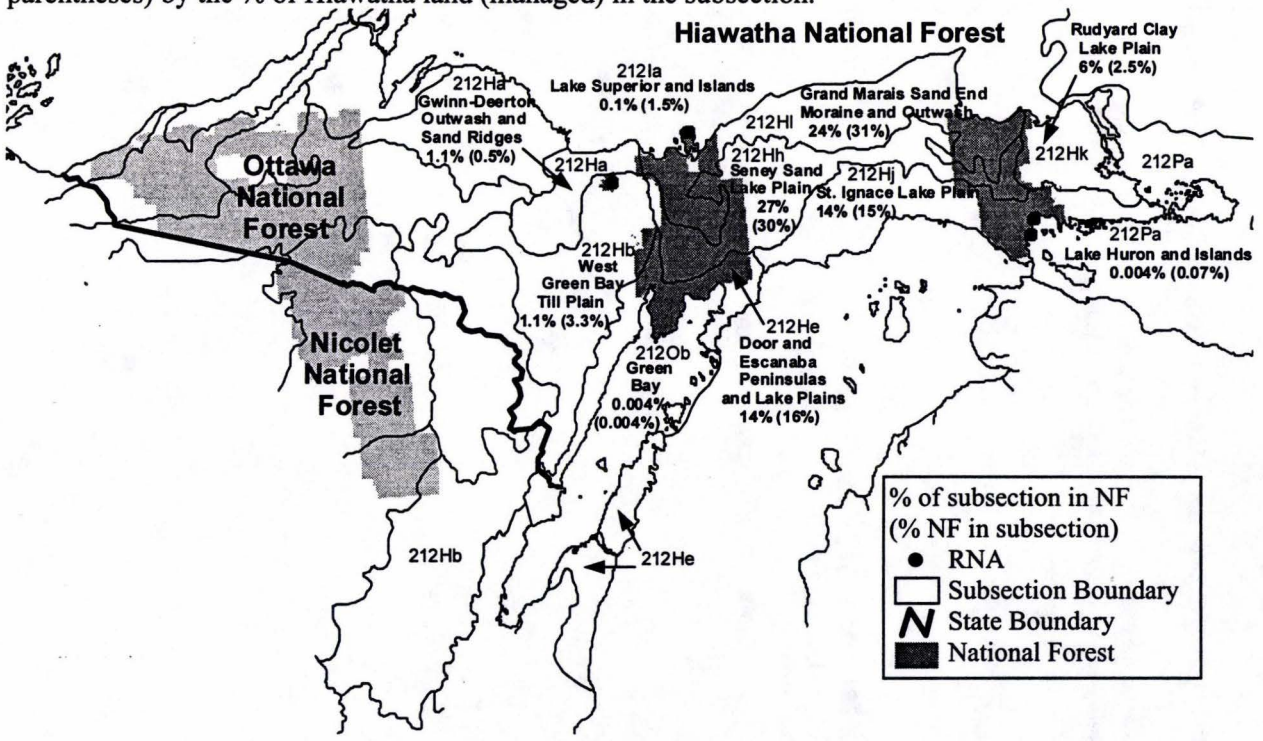
Hiawatha Figure 1. Location of the Hiawatha National Forest



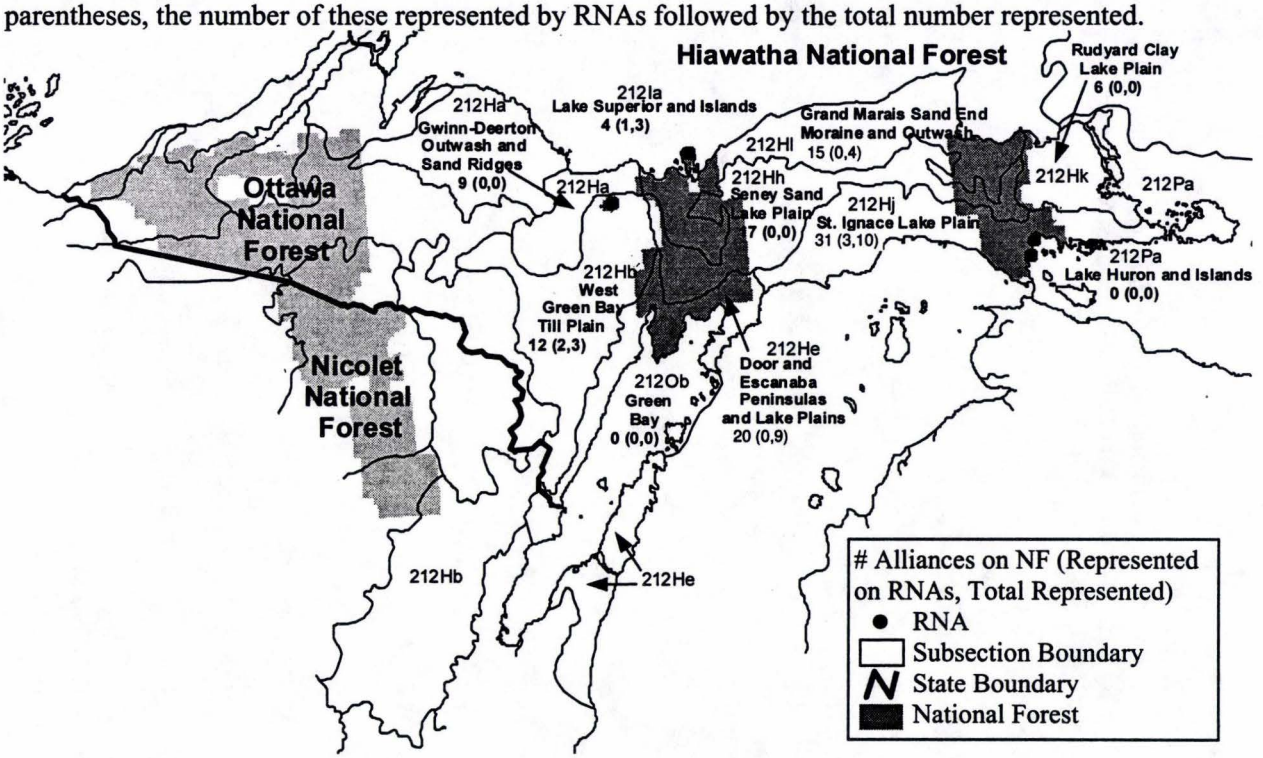
Hiawatha Figure 2. The Hiawatha National Forest with established RNAs and subsections. A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Hiawatha Figure 3. Hiawatha National Forest in relation to subsections.
National forests are shaded, but not all land in the shaded area is managed by the national forests. In each, the % of the subsection *managed* by the Hiawatha National Forest is shown, followed (in parentheses) by the % of Hiawatha land (managed) in the subsection.



Hiawatha Figure 4. Alliance representation on subsections of the Hiawatha National Forest.
National forests are shaded, but not all land in the shaded area is managed by the national forests. In each subsection is shown the number of alliances occurring on Hiawatha National Forest land*, and in parentheses, the number of these represented by RNAs followed by the total number represented.



* For Subsection 212Hb, alliances found on the Chequamegon-Nicolet but not on the Hiawatha are *not* included in the total. Totals including Chequamegon-Nicolet alliances are shown in Table 7b.

Hiawatha Appendix A. Subsections of the Hiawatha National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Hiawatha Table 5 for information on the format of this table. The difference between these two tables is that Hiawatha Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Hiawatha Table 5, i.e. to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Hiawatha NF-- 212Hh (SSP)		212Hl (GMS)		212Hj (SIP)		212He (DEP)		212Hk (RCP)		212Ha (GDO)		212Hb* (WGB)		212Ob (GB)		212Ia (LSI)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	•		•		•		•		•		•		•					
Black Oak - (Northern Pin Oak) Wooded Herbaceous Alliance													▫					
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Black Spruce Forest Alliance																	(1)	•
Northern White Cedar - Yellow Birch Forest Alliance																		
Northern White Cedar Forest Alliance					(4)	•	•						•		•		•	
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance			•		•		•						•					
Red Oak - Sugar Maple - (White Oak) Forest Alliance																	•	
Quaking Aspen Forest Alliance													•					
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance							•						▫					
White Pine - Oak (White, Red) Wooded Herbaceous Alliance													•					

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

Community Pattern **Alliances not Reported on NF Land**	**--Subsections of Hiawatha NF--**								
	212Hh (SSP)	**212Hl (GMS)**	**212Hj (SIP)**	**212He (DEP)**	**212Hk (RCP)**	**212Ha (GDO)**	**212Hb* (WGB)**	**212Ob (GB)**	**212Ia (LSI)**
Big Bluestem - (Canada Bluejoint, Switchgrass) Herbaceous Alliance				▪					
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance							▫		
Prairie Dropseed - Spikerush Seasonally Flooded Herbaceous Alliance			(1) ▪				▪		
Tussock Sedge Seasonally Flooded Herbaceous Alliance							▪		
Rock Outcrop/Butte Sparse Vegetation							▫		
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Red Maple - Green Ash Seasonally Flooded Forest Alliance				▪			▪		
White Pine - (Red Maple) Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪		
Northern White-cedar Woodland Alliance			▪			▪			
Lake Sedge Seasonally Flooded Herbaceous Alliance							▪		
Twig Rush Seasonally Flooded Herbaceous Alliance			(1) ▪					▪	▪
Skunk Cabbage - Marsh Marigold Saturated Herbaceous Alliance				▪					
Small Eroding Cliffs/Banks Sparse Vegetation									(1) ▪
Wet Cliff Sparse Vegetation				▫			▪		
Sand Flats Temporarily Flooded Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪		▪

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

Hiawatha Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Hiawatha National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Subsection 212Hh. Seney Sand Lake Plain						
Seney Sand Lake Plain (212Hh) Total:						
Subsection 212Hi. Grand Marais Sand End Moraine and Outwash						
Matrix Alliances						
White Pine Forest Alliance		Swamp Lakes	85	C AB BC	B	
White Spruce - Balsam Fir - Aspen Forest Alliance		McMahon Lake	816	B AB BC	AB	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		McMahon Lake	488	C AB BC	B	
Large Patch Alliances						
Black Spruce Saturated Forest Alliance		McMahon Lake	607	A AB BC	AB	
Northern White Cedar Saturated Forest Alliance		McMahon Lake	606	A AB BC	AB	
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance		Swamp Lakes	99	B AB BC	B	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		McMahon Lake	288	B AB BC	AB	
Small Patch Alliances						
Wiregrass Sedge Saturated Herbaceous Alliance		McMahon Lake	92	A A BC	AB	
Grand Marais Sand End Moraine and Outwash (212Hi) Total.			3,081			
Subsection 212Hj. St. Ignace Lake Plain						
Matrix Alliances						
White Spruce - Balsam Fir - Aspen Forest Alliance	Horseshoe Bay		118	C AB BC	B	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Horseshoe Bay		30	D AB BC	BC	
		Dudley Bay	120	C AB BC	B	
Quaking Aspen - Paper Birch Forest Alliance	Horseshoe Bay		8	D C B	C	
		Dudley Bay	150	C AB BC	B	
Large Patch Alliances						
Northern White Cedar Forest Alliance		Dudley Bay	70	B AB BC	B	
		Little Lasalle Island	55	B AB BC	B	
		Marquette Island	444	B AB BC	AB	
		Maxton Plains	553	A AB BC	AB	
Northern White Cedar - Red Maple Saturated Forest Alliance		Dudley Bay	47	C AB BC	B	
Northern White Cedar Saturated Forest Alliance		Dudley Bay	160	B AB BC	B	
		Little Lasalle Island	3	D AB BC	C	
		Marquette Island	453	B AB BC	AB	
		Maxton Plains	60	B AB BC	AB	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Prairie Dropseed - Spikerush Seasonally Flooded Herbaceous Alliance		Maxton Plains	180	B AB BC	B	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Marquette Island	35	C AB BC	B	
		Maxton Plains	35	C AB BC	B	
Northern White Cedar Complex	Horseshoe Bay		1,909	A AB B	AB	
		Dudley Bay	90			
Small Patch Alliances						
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Dudley Bay	45	B AB BC	B	
		Little Lasalle Island	3	C AB BC	B	
Twig Rush Seasonally Flooded Herbaceous Alliance		Marquette Island	23	B AB BC	B	
Wiregrass Sedge Saturated Herbaceous Alliance		Dudley Bay	6	B AB BC	B	
Cobble/Gravel Shore Sparse Vegetation	Horseshoe Bay			? AB B	B	
		St. Ignace Lake Plain (212Hj) Total:	4,597			

Subsection 212He. *Door and Escanaba Peninsulas and Lake Plains*

Shrubby Cinquefoil / Sedge Saturated Shrub Herbaceous Alliance		Coffee Swamp	2	AB BC		
Matrix Alliances						
Eastern Hemlock - Yellow Birch Forest Alliance		Newport Conifer-Hardwoods ?	25	D AB BC	QC	?
		Peninsula Park Beech Forest	70	C AB BC	B	
Eastern White Pine - Eastern Hemlock Forest Alliance		Toft Point	508	B AB BC	B	
White Spruce - Balsam Fir - Aspen Forest Alliance		Baileys Harbor Boreal Forest and Wetlands ?	47	D AB BC	QC	?
		Marshall's Point ?	96	C AB BC	QB	?
		Moonlight Bay Bedrock Beach ?	101	C AB BC	QB	?
		Newport Conifer-Hardwoods ?	35	D AB BC	QBC	?
		The Ridges Sanctuary ?	80	C AB BC	QB	?
		Toft Point ?	62	C AB BC	QB	?
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		Newport Conifer-Hardwoods	60	C AB BC	B	
Large Patch Alliances						
Northern White Cedar Saturated Forest Alliance		Newport Conifer-Hardwoods	15	C AB BC	B	
		Peninsula Park White Cedar Forest	35	C AB BC	B	
		The Ridges Sanctuary	602	A AB BC	AB	
Speckled Alder Seasonally Flooded Shrubland Alliance		Mink River Estuary	40	C AB BC	B	
		Newport Conifer-Hardwoods	3	D B BC	C	
		Whitefish Dunes	9	C AB BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance		The Ridges Sanctuary	65	B AB BC	B	
American Beachgrass Herbaceous Alliance		Peninsula Park White Cedar Forest	1	D AB BC	BC	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L Rank ?
American Beachgrass Herbaceous Alliance		Whitefish Dunes	33	C AB BC B
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Mink River Estuary	50	B AB BC B
Herbaceous Dunes Sparse Vegetation		Peninsula Park White Cedar Forest	0	U AB BC U
		Whitefish Dunes	33	C AB BC B
Northern White Cedar Complex		The Ridges Sanctuary ?	0	U AB BC QU ?
Small Patch Alliances				
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Toft Point	15	B B BC B
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Mink River Estuary	85	A AB BC AB
		Mud Lake	0	U AB BC U
		Peninsula Park White Cedar Forest	10	B AB BC B
		Toft Point	48	B B BC B
		Whitefish Dunes	4	C B BC BC
Open Bluff/Cliff Sparse Vegetation		Peninsula Park Beech Forest	0	U AB BC B
Wet Cliff Sparse Vegetation		Peninsula Park White Cedar Forest ?	2	C AB BC QB ?
Northern Sea Rocket Sparsely Vegetated Alliance		Mink River Estuary ?	2	C AB BC QB ?
		Newport Conifer-Hardwoods	2	C B BC BC
		Peninsula Park White Cedar Forest	0	U AB BC U
		The Ridges Sanctuary	20	B AB BC B
		Whitefish Dunes	8	B AB BC B
		Door and Escanaba Peninsulas and Lake Plains (212He) Total:	2,168	

Subsection 212Hk. *Rudyard Clay Lake Plain*

		Rudyard Clay Lake Plain (212Hk) Total:		

Subsection 212Ha. *Gwinn-Deerton Outwash and Sand Ridges*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance		Laughing Whitefish Falls Scenic Site	80	C AB BC BC
		Gwinn-Deerton Outwash and Sand Ridges (212Ha) Total:	80	

Subsection 212Hb. *West Green Bay Till Plain*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance	Dukes		32	D B B C
Eastern Hemlock Forest Alliance	Dukes		5	D AB B BC
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Dukes		94	C AB B B
		Tellock's Hill Woods ?	54	C AB BC QBC ?
Large Patch Alliances				
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		Mukwa Bottomland Forest ?	160	B AB BC QB ?
Northern White Cedar Saturated Forest Alliance	Dukes		102	B B B B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Leatherleaf Saturated Dwarf-Shrubland Alliance		Hortonville Bog	470	B AB BC	B
Small Patch Alliances					
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Shaky Lake	4	C B BC	BC
Wiregrass Sedge Saturated Herbaceous Alliance		Shaky Lake	100	A AB BC	AB
		West Green Bay Till Plain (212Hb) Total:	1,021		

Subsection 212Ia. *Lake Superior and Islands*

Matrix Alliances					
Eastern Hemlock - Yellow Birch Forest Alliance	Grand Island		41	D AB AB	BC
		Apostle Islands Maritime Cliffs ?	36	D AB BC	QBC ?
		Apostle Islands Maritime Forest ?	597	C AB B	QB ?
Red Pine Forest Alliance		Apostle Islands Sandscape ?	257	C AB B	QB ?
White Spruce - Balsam Fir - Aspen Forest Alliance		Apostle Islands Maritime Cliffs	5	D AB BC	BC
		Apostle Islands Maritime Forest	263	C AB B	B
		Susie Island	100	C AB A	A
Large Patch Alliances					
Black Spruce Forest Alliance		Susie Island	19	D AB A	B
Black Spruce Saturated Forest Alliance		Susie Island	25	C AB A	A
Leatherleaf Saturated Dwarf-Shrubland Alliance		Apostle Islands Sandscape	66	B AB B	B
American Beachgrass Herbaceous Alliance		Apostle Islands Sandscape ?	43	C AB B	QB ?
Herbaceous Dunes Sparse Vegetation		Apostle Islands Sandscape ?	42	C AB B	QB ?
Small Patch Alliances					
Eastern Hemlock Saturated Forest Alliance	Grand Island		18	C AB AB	B
Open Bluff/Cliff Sparse Vegetation	Grand Island		0	U AB AB	I
		Apostle Islands Maritime Cliffs	0	U AB BC	B
Small Eroding Cliffs/Banks Sparse Vegetation		Apostle Islands Maritime Forest	0	U AB B	B
Open Pavement Sparse Vegetation		Susie Island	2	C AB A	A
Northern Sea Rocket Sparsely Vegetated Alliance	Grand Island		0	U AB AB	I
		Apostle Islands Sandscape	44	B AB B	B
		Lake Superior and Islands (212Ia) Total:	1,558		

Subsection 212Pa. *Lake Huron and Islands*

		Lake Huron and Islands (212Pa) Total:			

Subsection 212Ob. *Green Bay*

Matrix Alliances					
White Spruce - Balsam Fir - Aspen Forest Alliance		Jackson Harbor Ridges	47	D AB BC	C
Large Patch Alliances					

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
American Beachgrass Herbaceous Alliance		Jackson Harbor Ridges ?	7	C AB BC	QB	?
Herbaceous Dunes Sparse Vegetation		Jackson Harbor Ridges ?	7	C AB BC	QB	?
Small Patch Alliances						
Cobble/Gravel Shore Sparse Vegetation		Sister Islands	15	B AB BC	B	
Northern Sea Rocket Sparsely Vegetated Alliance		Jackson Harbor Ridges	9	B AB BC	B	
		Green Bay (212Ob) Total:	85			
		Grand Total:	12,590			

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Hiawatha Appendix C. Unrepresented alliances (Forest-wide) on the Hiawatha National Forest

In this assessment alliances were prioritized by community pattern *within* subsections. The RNA committee of the Hiawatha National Forest may also want to prioritize RNA selection and establishment by looking at the representation of alliances in the National Forest as a whole. If an alliance is not represented on *any* National Forest subsection, it may be a higher priority to represent in *at least one* subsection than it is to represent another alliance in an *additional* subsection.

The following alliances are not represented in any of the subsections in which they occur on Hiawatha National Forest land, and may therefore be a priority to represent in at least one subsection:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance
- Silver Maple Temporarily Flooded Alliance
- Black Spruce - Tamarack Saturated Forest Alliance
- Tamarack Saturated Forest Alliance
- Black Spruce Saturated Woodland Alliance
- American Beachgrass Herbaceous Alliance
- Canada Bluejoint Seasonally Flooded Herbaceous Alliance
- Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance
- (Jack Pine, Red Pine) Woodland Alliance
- Bog Birch - (Willow) Saturated Shrubland Alliance
- Open Pavement Sparse Vegetation
- Non-tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation.

Hiawatha Appendix D. Alliances reported on Chequamegon-Nicolet National Forest land in Subsection 212Hb, but not on Hiawatha National Forest land.

Speckled Alder Seasonally Flooded Shrubland Alliance*
Black Ash - Red Maple Saturated Forest Alliance*
Inland Strand Beach Sparse Vegetation*
Yellow Water Lily – White Water Lily Permanently Flooded Herbaceous Alliance*
Black Spruce Saturated Woodland Alliance
(Jack Pine, Red Pine) Woodland Alliance
Jack Pine - Oak (Northern Pin, Black) Forest Alliance*
Jack Pine Forest Alliance
White Pine Forest Alliance
Quaking Aspen - Paper Birch Forest Alliance
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance
Black Oak - Northern Pin Oak Forest Alliance*
Eastern Hemlock Saturated Forest Alliance

* This alliance does not occur on Hiawatha land in any subsection.

Hiawatha Appendix E. Potential RNA-equivalents containing Element Occurrences (EOs) in the Michigan Natural Heritage Database.

- **These areas have not been evaluated for RNA-equivalency.**
- An entire area or a definable portion of an area may be determined to be an RNA-equivalent.
- Subsection(s) is the list of subsections of the centrum of each EO (from a GIS overlay). These are not necessarily the subsections in which the managed area occurs.

Agency	Name	Subsection(s)
USFS (Hiawatha)	Horseshoe Bay Wilderness	212Hj
	Rock River Canyon Wilderness	212Ha, 212Hi
Great Lakes Program	Carp River Environmental Area	212Hj
	Charlotte Environmental Area	212Hk
	Crow River Environmental Area	212Hj
	Fishdam River Environmental Area	212He
	Gogomain Environmental Area	212Hk
	Mismer Bay Environmental Area	212Hj
	Neebish Environmental Area	212Hk
	Pointe Aux Chenes Bay Environmental Area	212Hj
	Pontchartrain Environmental Area	212Hj
	Roach Point Environmental Area	212Hk
	Sailor's Creek Environmental Area	212Hk
	Seiner's Point Environmental Area	212Hj
	Whitefish Environmental Area	212He
	Winter Environmental Area	212Hk
National Park Service	Grand Island National Recreation Area	212Ia
	Pictured Rocks National Lakeshore	212Hi, 212Ia
US Fish & Wildlife Service	Northern Hardwoods Research Natural Area	212Hj
	Stangmoor Bog Research Natural Area	212Hh
Michigan Forest Management	Northshore Research Natural Area	212Hj
	Snake Island-Mud Lake Nature Study Area	212Hj
Michigan Parks and Recreation	Betsy Lake Research Natural Area	212Hi
Michigan Nature Association	Escanaba River Shorelands Preserve	212Hb
	Keweenaw Shore #2 Plant Preserve	212Ia
	Purple Coneflower Plant Preserve	212Hj
	Roach Point Nature Sanctuary	212Hk

IX. F. Hoosier National Forest RNA Assessment

HOOSIER SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Hoosier National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Hoosier National Forest lands. The Hoosier National Forest occupies portions of 4 subsections. Based on data from the 3 dominant subsections, at least 17 alliances occur on Hoosier lands, with the number of alliances in each subsection ranging from 2 to 15. In these 3 subsections there are 24 alliance-subsection combinations; these are the ecosystems to represent for the Hoosier National Forest. The number of alliances identified in each subsection on the National Forest is still incomplete.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

One of the Hoosier National Forest alliance-subsection combinations is represented by the currently established RNA.

Existing **RNA-equivalents** in the 4 subsections include:

- 25 Indiana State Nature Preserves,
- 14 private Nature Preserves, and
- 11 USDA Forest Service Special Areas.

These 50 RNA-equivalents, along with the 1 RNA, currently represent 10 (42%) of the Hoosier alliance-subsection combinations (ecosystems). The number of alliance-subsection combinations and the number of represented ecosystems are probably both larger, because community data were not complete for the National Forest and for many RNA-equivalents. Identifying alliances in protected areas could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTED ECOSYSTEMS

The Hoosier has 14 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, the **high-priority subsection** for the Hoosier National Forest is:

- Brown County Hills (222Em)

None of the alliances are represented in this subsection.

With 11% prominence and 57% of its alliances represented, the Crawford Uplands (222De) is a **medium-priority subsection**. The Crawford Escarpment (222Df) is also medium-priority based on its prominence. Although both alliances identified in this subsection are represented, but number of alliance-subsection combinations will undoubtedly increase when more complete information is acquired.

The Mitchell Karst Plains (222Ek) is a **low-priority subsection**, with only 0.1% prominence.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there are 3 **high-priority alliances** (of 15 Hoosier alliances). These may be high-priority in each subsection in which they occur. One is not represented in *any* subsection in which it occurs on Hoosier land:

- White Oak - (Red Oak, Hickory species) Forest Alliance.

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IX.F.1. INTRODUCTION

The Hoosier National Forest is located in southern Indiana (Hoosier Figure 1). Its proclamation boundaries and purchase unit boundaries contain 644,341 acres, with 195,605 acres (30%) of this land currently (FY97) managed by the Hoosier.

The Hoosier National Forest occurs entirely in Province 222 (Eastern Broadleaf Forest (Continental) Province). Appendix VIII lists the other national forests in this Province. The Hoosier National Forest can work with these national forests to evaluate province-wide representation and establish priorities for the Province.

IX.F.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Hoosier.

IX.F.2.a. Subsections

We identified the subsections occurring on the Hoosier NF using the digital subsection map of Keys *et al.* (1995) produced at a scale of 1:3,500,000 and a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo). The Natural Divisions and Sections map of Indiana (Homoya *et al.* 1985, no scale given, but approximately 1:800,000) is similar in concept to the Keys *et al.* (1995) map and was also used to assist in the identification of national forest land by subsection and natural area locations.

We used the digital maps to determine the amount of land in each subsection within Hoosier proclamation boundaries and purchase units. To estimate ownership acreage within each subsection, we multiplied these values by 30%, the fraction of ownership to proclamation acres for the entire Hoosier National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with national forest land (ownership).

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence. The percent of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.F.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Indiana, we first compiled the natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated to associations (one classification level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Our data about the occurrence of these alliances on national forest land are very limited. They came from:

- a Hoosier survey of Landtype Phases (LTPs) in Subsections 222De and 222Em (Van Kley *et al.* 1995)—by matching alliances to the LTPs, we were able to list some national forest alliances in these 2 subsections,
- and from the communities listed for Forest Service Special Areas by Steve Olson, RNA-coordinator of the Hoosier National Forest.

Because expert knowledge was not used for the National Forest as a whole, the number of communities is underestimated and needs complete review. Data for Subsections 222Df and 222Ek are especially incomplete.

IX.F.2.c. Identifying RNA-equivalents

RNA-equivalents were identified by Mike Homoya of Indiana Heritage and Steve Olson of the Hoosier National Forest. The RNA Committee of the Hoosier National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.F.2.d. Digitizing RNAs

The Hoosier National Forest provided a USGS 7.5 minute (1:24,000 scale) topographical map with an outline of the Pioneer Mothers RNA boundary. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Hoosier RNAs (Hoosier Figure 2) in the projection used by the Hoosier (UTM 16 NAD 27), or a Region-wide RNA cover at regional projections.

IX.F.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All Hoosier National Forest RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

Our sources for community occurrences on Indiana State Nature Preserves and TNC Preserves were Element Occurrence data from the Indiana Natural Heritage Data Center. Total acreage for each SNA or Preserve also came from the Indiana Natural Heritage Data Center. Our results were reviewed in part by Michael Homoya. Questions remain on several of the SNAs (Hoosier Appendix B).

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Hoosier Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Hoosier National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.F.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Hoosier National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.F.3.a. Subsections on national forest land

The 4 subsections which occur on Hoosier National Forest land are listed below (Hoosier Figure 2). These subsections are listed in order of *prominence*, the percent of the subsection on national forest land (Hoosier Table 4).

- Crawford Uplands (222De)
- Brown County Hills (222Em)
- Crawford Escarpment (222Df)
- Mitchell Karst Plains (222Ek)

The majority of the Hoosier National Forest land occurs on 2 subsections (Hoosier Table 4, Hoosier Figure 3): Crawford Uplands (222De, 68% of National Forest land) and Brown County Hills (222Em, 22%). In addition, large portions of these subsections are managed by Hoosier—approximately 11% of 222De and 7% of 222Em—*i.e.*, the Hoosier has high *prominence* of land coverage in these subsections.

About 10% of the Hoosier National Forest is in the Crawford Escarpment (222Df), and it manages about 4% of the subsection. Less than 1% of Subsection 222Ek is managed by the Hoosier, and it occupies less than 1% of total National Forest land. A few acres of Subsection 222Ff (Scottsburg Lowland) may also occur in the Hoosier, but it is not included in this report.

IX.F.3.b. Natural communities within subsections

A total of 30 alliances are reported to occur in the 4 subsections. Alliances on National Forest land have been identified for the 2 dominant Hoosier subsections (222De and 222Em) and for subsection 222Df, but not for 222Ek, which is less than 1% of the Forest. In the 3 subsections with data, 17 alliances have been identified to occur on National Forest land (Hoosier Table 5, first column). Because data about alliances on National Forest land are limited (see Methods), the actual number of alliances on National Forest land is probably higher. Thus, there are probably more ecosystems to represent than discussed in this report. The 13 alliances reported for the 4 subsections but not reported to occur on national forest land are listed in Hoosier Appendix A; they should be reviewed for presence on national forest land.

Of the 17 alliances reported to occur on the Hoosier, 3 are **matrix** alliances (see Hoosier Table 5, first set of alliances), 8 are **large patch** (second set) and 6 are **small patch** (third set). (See "National Vegetation Classification," pp. 8-9.)

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on Hoosier land in each subsection:

- Crawford Uplands (222De): 15 alliances (3 matrix, 6 large patch, 6 small patch)
- Brown County Hills (222Em): 7 alliances (3 matrix, 3 large patch, 1 small patch)
- Crawford Escarpment (222Df): 2 alliances (1 matrix, 1 large patch)
- Mitchell Karst Plains (222Ek): *unknown*

Based on these data, there are a total of 24 subsection-alliance combinations on Hoosier land. However we expect this number to be higher, and further review is needed to identify missing alliance-subsection combinations.

IX.F.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents. The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each

alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Hoosier Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Hoosier Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

The Hoosier National Forest has one established RNA (Hoosier Table 1, Hoosier Table 6) and 5 candidate RNAs (cRNAs). Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs on the Hoosier National Forest (Hoosier Figure 2) is available in the projection used by the Hoosier (UTM 16 NAD 27) from the Regional RNA Coordinator. A Regional RNA cover is also available at a regional projection.

RNA-equivalents

Mike Homoya of Indiana Heritage, along with the authors, consider the following as RNA-equivalents in Indiana:

- all Indiana Department of Natural Resources "Nature Preserves"
- private "Nature Preserves" of The Nature Conservancy and The Sycamore Land Trust.

In addition, Steve Olson, RNA coordinator of Hoosier National Forest, indicated that portions of

- Forest Service Special Areas (8.2)

are RNA-equivalents. (See Hoosier Appendix D for a list of this areas and how much is considered Level 1.)

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Hoosier Table 3). These include several private sites given a high protection designation by the Indiana Natural Heritage Data Center, but which were not also designated as Nature Preserves. Hoosier personnel can work with conservation partners to review these and other sites to find additional RNA-equivalents. According to Mike Homoya, no state, private, or local "Natural Areas" are RNA-equivalents; and according to Steve Olson, no Forest Service Special *Interest* Areas are RNA-equivalents.

Twenty-three Indiana State Nature Preserves, 14 private Nature Preserves, 2 local government Nature Preserves, and 11 Forest Service Special Areas are RNA-equivalents for the Hoosier assessment (Hoosier Table 6, 7a). Only portions of these 11 Special Areas are considered to have RNA-equivalent status. Only the acreage of the RNA-equivalent portion is given for each area. (For total acreage, see Hoosier Appendix D.)

Several new Special Areas and additions to existing Special Areas are proposed for the Hoosier National Forest (see Hoosier Appendix D). Once these are officially designated, the alliances that occur in them may represent additional ecosystems, depending on RNA-equivalent status and the rank of each alliance occurrence. Forest Service Special Areas must be evaluated individually for RNA-equivalency.

Community data are incomplete for these RNA-equivalents, and some alliance occurrences could not be ranked due to incomplete information in some Indiana Element Occurrence Records. As a result there is likely to be a higher number of represented ecosystems than indicated below.

On the other hand, recognizing that few large occurrences of natural communities remain in Indiana, we were generous with size ranks. Generous ranks are marked in Hoosier Appendix B with an asterisk (*). Some of these occurrences may actually be too small to provide representation.

Crawford Uplands (Subsection 222De)

Subsection 222De contains no RNAs, but does contain 9 Forest Service Special Areas with RNA-equivalent portions (1,552 acres total; Hoosier Figure 3, Hoosier Tables 6, 7a):

- Bull Hollow Barrens (32)
- Carnes Mill (110)
- Clover Lick Barrens (240)
- Harding Flats (65)
- Plaster Creek/Pleasant Valley (310)
- Rockhouse Hollow (40)
- Shootingstar Cliffs (600)
- Virginia Saxifrage (55)
- Wheatley Branch Barrens (100);

6 Indiana State Nature Preserves, covering 864 acres:

- Armstrong Glade (44)
- Bluffs Of Beaver Bend (208)
- Jug Rock (34)
- Yellow Birch Ravine (441)
- Henshaw Bend (77)
- Tank Spring (60);

and 6 TNC preserves, covering 392 acres:

- Boone Creek Barrens (40)
- Carnes Mill (25)
- Fern Cliff (157)
- Green's Bluff (90)
- Plaster Creek Seeps (14)
- Saalman Hollow (66).

Thus, 2,808 acres (0.2%) of the subsection are protected by RNA-equivalents (Hoosier Table 7a).

Natural Communities (Alliances)

Of 15 alliances reported to be on national forest land in Subsection 222De, 8 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Hoosier Table 5, column 222De; Hoosier Table 7b; Hoosier Figure 4).

Of 3 matrix alliances, 2 are represented; of 6 large patch alliances, 2 are represented; and 4 of the 6 small patch alliances are represented.

One unrepresented matrix alliance and 1 unrepresented large patch alliances have low-quality occurrences on RNA-equivalents (Hoosier Appendix B):

- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix)
- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (large patch)

Brown County Hills (Subsection 222Em)

Subsection 222Em contains no RNAs, but does contain 6 Indiana State Nature Preserve covering 287 acres (Hoosier Figure 3, Hoosier Tables 6, 7a):

- Hemlock Bluff (44)
- Crooked Creek (35)
- Knobstone Glades (60)

- Scout Ridges (15)
- Steele (Selma) (92)
- Ogle Hollow (41)

and 2 preserves of The Nature Conservancy, together covering 303 acres:

- Blue Bluff (32)
- Hitz - Rhodehammel Woods (271).

Thus, 590 acres (0.09%) of the subsection are protected by RNA-equivalents (Hoosier Table 7a).

Natural Communities (Alliances)

The 3 matrix alliances, 3 large patch alliances, and 1 small patch alliance reported to be on national forest land in Subsection 222Em are not currently represented by high-quality (A- or B-ranked) occurrences in RNA-equivalents (Hoosier Table 5, column 212Hi; Hoosier Table 7b; Hoosier Figure 4).

Two matrix alliances and 1 large patch alliance have low-quality occurrences on RNA-equivalents (Hoosier Appendix B):

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance (matrix)
- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix)
- Silver Maple Temporarily Flooded Forest Alliance (large patch)

Crawford Escarpment (222Df)

Subsection 222Df contains 1 RNA, covering 88 acres (Hoosier Figure 3, Hoosier Tables 6, 7a):

- Pioneer Mothers (88).

The subsection also contains 2 Forest Service Special Areas with RNA-equivalent portions (165 acres):

- Faucett Chapel (25)
- Pioneer Mothers Memorial Forest (140);

5 Indiana State Nature Preserves, together covering 1,336 acres:

- Bat Wing Cave (10)
- Deam (Charles C.) (259)
- Leavenworth Barrens (761)
- Post Oak - Cedar (266)
- Scout Mountain (40);

and 2 TNC preserves, covering 128 acres:

- Dewey Hickman (125)
- Orangeville Rise of Lost River (3).

Thus, 1,629 acres (0.4%) of the subsection are protected by RNAs and RNA-equivalents (Hoosier Table 7a).

Natural Communities (Alliances)

Two alliances are reported to be on national forest land in Subsection 222Df, and both are represented by a high-quality (A- or B-ranked) occurrence on Pioneer Mothers RNA and Faucett Chapel Special Area (Hoosier Table 5, column 212Hj; Hoosier Table 7b; Hoosier Figure 4).

Mitchell Karst Plains (222Ek)

Subsection 222Ek contains no RNAs, but does contain 8 Indiana State Nature Preserves, together covering 804 acres (Hoosier Figure 3, Hoosier Tables 6, 7a):

- Big Spring (10)
- Charles Spring (109)
- Mosquito Creek (121)
- Donaldson's Cave (6)
- Donaldson's Woods (67)
- Wolf Cave (214)
- Griffy Woods (240)
- Hayswood (37);

3 preserves of The Nature Conservancy, covering 115 acres:

- Cedar Bluffs (23)
- Teeple Glade (82)
- Three-way Sedge Sinkhole Swamp (10);

and 1 preserve of the Sycamore Land Trust, covering 80 acres:

- Bean Blossom Bottoms.

Thus, 999 acres (0.07%) of the subsection are protected by RNA-equivalents (Hoosier Table 7a).

Natural Communities (Alliances)

We have no information about alliances on national forest land in this subsection. Thus representation goals are still undefined.

IX.F.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Hoosier National Forest. The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Hoosier Table 5 by shaded cells which contain no number. Alliances that are not represented in any Hoosier subsection (unrepresented Forest-wide) are listed in Hoosier Appendix C.

Subsection	Dominance Percentage of Hoosier NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Hoosier NF land	Percentage of NF alliances represented	Proposed priority
222Em. Brown County Hills	22	0.09	7	0	high
222De. Crawford Uplands	68	0.2	11	53	medium
222Df. Crawford Escarpment	10	0.4	4	100?	medium
222Ek. Mitchell Karst Plains	<1	0.07	0.1	*unknown*	low

The subsections with the highest prominence and dominance are 222Em and 222De. Of these, we have assigned a high priority to 222Em because none of its 7 alliances are represented, and medium priority to 222De because 53% of its alliances are represented. All 4 subsections have relatively low prominence, so priority is based mostly on the percent of alliances currently represented. Subsection 222Df is medium priority based on its intermediate prominence and dominance. The figure of 100% alliances is misleading because only 2 alliances have been reported on national forest land in this subsection. Although all subsections need review, the list of alliances is especially incomplete for this subsection.

With less than 1% prominence, Subsection 222Ek is low priority. However, it should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. The list of alliances needs review for each of these 4 subsections. The priority order could change with additional information.

Brown County Hills (Subsection 222Em)

None of the 7 alliances in this subsection are represented (Hoosier Table 7b, Hoosier Figure 4). The 3 matrix alliances may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance*
- Black Oak - White Oak Forest Alliance
- White Oak - (Red Oak, Hickory species) Forest Alliance*.

Both marked (*) alliances have low-quality occurrences on Crooked Creek State Nature Preserve. The American Beech - Sugar Maple - (Tuliptree) Forest Alliance also has a low-quality occurrence on Ogle Hollow State Nature Preserve. The White Oak - (Red Oak, Hickory species) Forest Alliance has additional low-quality occurrences on Hemlock Bluff State Nature Preserve and Scout Ridge State Nature Preserve. The quality/viability of these occurrences should be verified. One unrepresented large patch alliance in this subsection also has a low-quality occurrence on an RNA-equivalent:

- Silver Maple Temporarily Flooded Forest Alliance (large patch--Hemlock Bluff State Nature Preserve).

Crawford Escarpment (222Df)

Both of the 2 alliances reported from this subsection are represented (Hoosier Table 7b, Hoosier Figure 4), but additional alliances need to be identified for the subsection. The one matrix alliance reported for this subsection is represented.

Crawford Uplands (Subsection 222De)

Of 15 alliances, 8 are represented, leaving 7 alliances (47%) in need of representation (Hoosier Table 7b, Hoosier Figure 4). The 1 unrepresented matrix alliance may be the highest priority for RNA establishment:

- White Oak - (Red Oak, Hickory species) Forest Alliance.

This alliance has low-quality occurrences on Rockhouse Hollow Special Area, Bluffs of Beaver Bend State Nature Preserve, and Yellow Birch Ravine State Nature Preserve (Hoosier Table 7b, Hoosier Appendix B). The quality/viability of these occurrences should be verified. One unrepresented large patch alliance in this subsection also has a low-quality occurrence on an RNA-equivalent:

- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (large patch--Plaster Creek/Pleasant Valley Nature Preserve).

Mitchell Karst Plains (222Ek)

No alliances have yet been identified on the estimated 1,532 acres of national forest land in Subsection 222Ek (Hoosier Table 7b, Hoosier Figure 4). Ecosystems cannot be represented until alliances have been identified.

HOOSIER TABLES

Hoosier Table 1. Established research natural areas (RNAs) of the Hoosier National Forest

RNA	Acres	Subsection	Established
Pioneer Mothers Memorial Forest RNA	88	212Hp	1944

Hoosier Table 2. Designations identified to date as RNA-equivalents for the Hoosier National Forest

Protected Area Designation	Managed by
State Nature Preserve	Indiana Department of Natural Resources, Division of Nature Preserves (ownership varies; see Hoosier Table 6)
Nature Preserve	The Nature Conservancy
Nature Preserve (*not* Natural Area)	The Sycamore Land Trust
Portions of Hoosier Special Areas (8.2), as determined by Steve Olson (*not* Special *Interest* Areas)	Hoosier National Forest

Hoosier Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Hoosier National Forest

Protected Area Designation	Managed by
Several sites given a high protection designation by the Indiana Natural Heritage Data Center, but not also designated as Nature Preserves	Private
Natural Areas, Managed Areas (probably *not* RNA-equivalents)	Indiana Dept. of Natural Resources

Hoosier Table 4. Subsections of the Hoosier National Forest, in order of prominence
"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is Hoosier NF acres divided by Hoosier National Forest total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Hoosier Figure 3.

Subsection*	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF in subsection
222De—Crawford Uplands	1,185,114	132,720	11	68
222Em—Brown County Hills	625, 014	42,376	7	22
222Df—Crawford Escarpment	454,062	18,977	4	10
222Ek—Mitchell Karst Plains	1,498,310	1,532	0.1	1
Hoosier National Forest total ownership:		195,605		

*A few acres of the National Forest may occur in Subsection 222Ff, the Scottsburg Lowland.

Hoosier Table 5. Subsections and alliances reported on Hoosier National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Hoosier Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) CU= Crawford Uplands, BCH= Brown County Hills, CE= Crawford Escarpment, MKP= Mitchell Karst Plains. A few acres of the Scottsburg Lowland subsection (222Ff) may also occur in the National Forest. For a list of alliances occurring in subsections of the Hoosier NF subsections but not reported on NF land, see Hoosier Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	◦ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Hoosier NF

Community Pattern **Alliances Reported on NF Land**	222De (CU)		222Em (BCH)		222Df* (CE)		222Ek *	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	(1) •	(6)	•	(2)	1 •	(1)	(3) •	(4)
Black Oak - White Oak Forest Alliance	(4) •	(1)	•		•		•	
White Oak - (Red Oak, Hickory species) Forest Alliance	•	(3)	•	(3)	(3) •	(1)	(1) •	(5)
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Chinquapin Oak Forest Alliance					(1) •			
Post Oak - Blackjack Oak Forest Alliance	•				•	(1)		
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	(1) •	(1)	•				•	
American Beech Temporarily Flooded Forest Alliance	•	(2)	•		•		•	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance	•	(1)	•				(1) •	
Silver Maple Temporarily Flooded Forest Alliance	•		•	(1)	•		•	
Chinquapin Oak Woodland Alliance	(1) •							
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance	•							
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance	•		•					
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	•				•		•	
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance	(3) •		•	(1)	•			

*Data about alliances on national forest land are incomplete in all 4 subsections, but particularly in the 2 starred subsections.

Subsections of Hoosier NF

Community Pattern **Alliances Reported on NF Land**	222De (CU)	222Em (BCH)	222Df* (CE)	222Ek *
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance	(5) ▪ (1)		(2) ▪	(2) ▪ (1)
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance	(1) ▪ (1)	▪		
Open Bluff/Cliff Sparse Vegetation	(8) ▪		▪	(2) ▪

*Data about alliances on national forest land are incomplete in all 4 subsections, but particularly in the 2 starred subsections.

Hoosier Table 6. RNAs and RNA-equivalents of the Hoosier National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)		
		USDA Forest Service Special Areas	Indiana State Nature Preserves	Private Nature Preserves (TNC or Sycamore Land Trust‡)
222De		• Bull Hollow Barrens (32) • Carnes Mill (110) • Clover Lick Barrens (240) • Harding Flats (65) • Plaster Creek/ Pleasant Valley (310) • Rockhouse Hollow (40) • Shootingstar Cliffs£ (600) • Virginia Saxifrage (55) • Wheatley Branch Barrens (100)	• Armstrong Glade (44) • Bluffs Of Beaver Bend (208) • Jug Rock (34) • Yellow Birch Ravine (441) • Henshaw Bend+ (77) • Tank Spring+ (60)	• Boone Creek Barrens (40) • Carnes Mill (25) • Fern Cliff (157) • Green's Bluff (90) • Plaster Creek Seeps (14) • Saalman Hollow (66)
222Em			• Hemlock Bluff (44) • Crooked Creek+ (35) • Knobstone Glades+ (60) • Scout Ridges+ (15) • Steele (Selma)† (92) • Ogle Hollow* (41)	• Blue Bluff (32) • Hitz - Rhodehammel Woods (271)
222Df	• Pioneer Mothers Memorial Forest (88)	• Faucett Chapel (25) • Pioneer Mothers Memorial Forest (140)	• Bat Wing Cave+ (10) • Deam (Charles C.)+ (259) • Leavenworth Barrens+ (761) • Post Oak - Cedar+ (266) • Scout Mountain+ (40)	• Dewey Hickman (125) • Orangeville Rise of Lost River (3)
222Ek			• Big Spring (10) • Charles Spring (109) • Mosquito Creek (121) • Donaldson's Cave* (6) • Donaldson's Woods* (67) • Wolf Cave* (214) • Griffy Woods§ (240) • Hayswood§ (37)	• Cedar Bluffs (23) • Teeple Glade (82) • Three-way Sedge Sinkhole Swamp (10) • Bean Blossom Bottoms‡ (80)

State Nature Preserves are designated by the Department of Natural Resources, Division of Nature Preserves, but they can be owned by the Indiana Divisions of Forestry+, Parks and Reservoirs*, or Museums & Memorials†, or local governments§. (§Griffy Woods Nature Preserve is owned by the Bloomington Parks and Recreation Department. Hayswood Nature Preserve is owned by the Harrison County Park and Recreation Board.)
£ Shooting Star Cliffs includes Hemlock Cliffs and Jubin Creek areas.

Hoosier Table 7. Summary of subsection representation on the Hoosier National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
222De. Crawford Uplands		21		2,808	2,808 *<1%*
222Em. Brown County Hills		8		589	589 *<1%*
222Df. Crawford Escarpment	1	9	88	1,629	1,717 *<1%*
222Ek. Mitchell Karst Plains		12		999	999 *<1%*
TOTAL	1	50	88	6,025	6,113 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *?* = unknown

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
222De. Crawford Uplands	15		8	8 53%	2
222Em. Brown County Hills	7			0 0%	3
222Df. Crawford Escarpment	2 *(+?)*	1	1	2 100%	
222Ek. Mitchell Karst Plains	*?*			*?*	

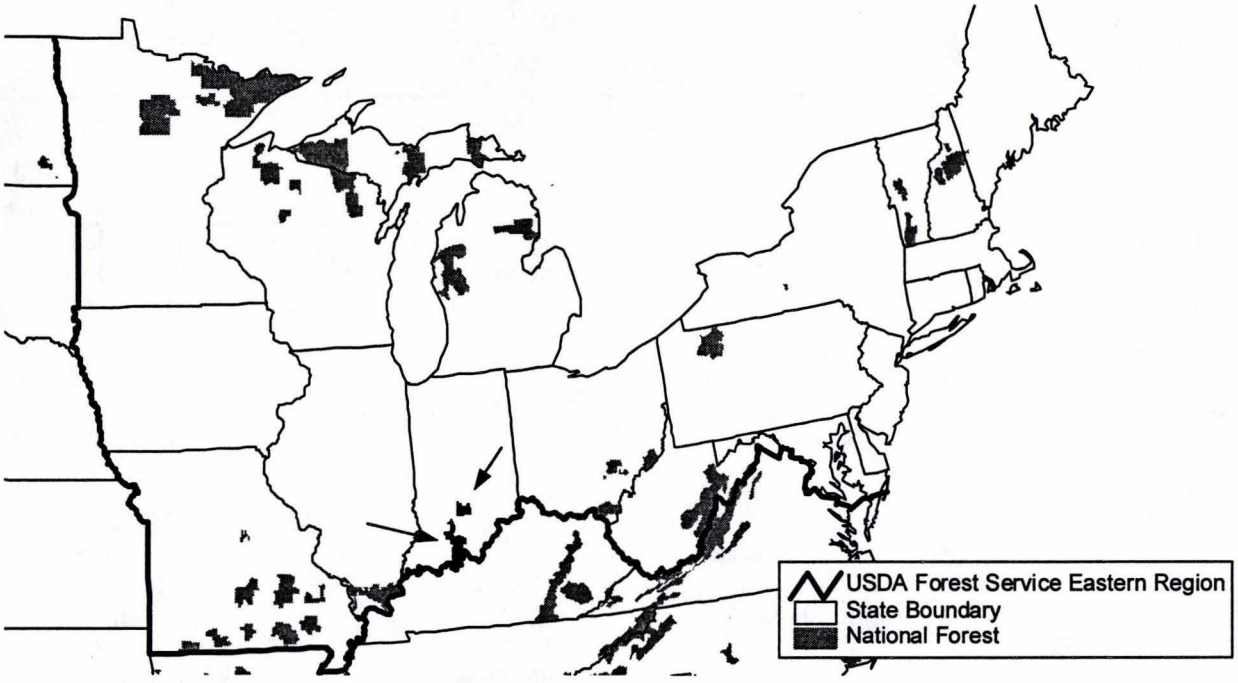
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Hoosier Table 8. Alliances of the Hoosier National Forest arranged by community pattern and community distribution

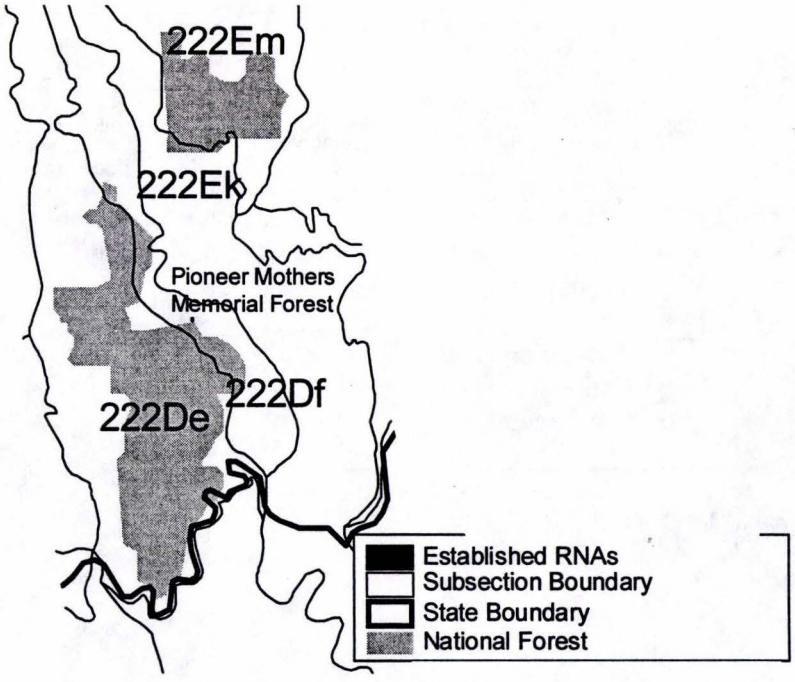
COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC			• Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous
LIMITED	• American Beech - Sugar Maple - (Tuliptree) Forest	• American Beech Temporarily Flooded Forest • Chinquapin Oak Woodland	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous • Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous
WIDESPREAD	• Black Oak - White Oak Forest • White Oak - (Red Oak, Hickory species) Forest	• Rock chestnut Oak - (Scarlet Oak, Black Oak) Seasonally Flooded Forest • Pin Oak - (Swamp White Oak) Seasonally Flooded Forest • Post Oak - Blackjack Oak Forest • Silver Maple Temporarily Flooded Forest	• Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous • Open Bluff/Cliff Sparse Vegetation • Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest
PERIPHERAL			

HOOSIER FIGURES

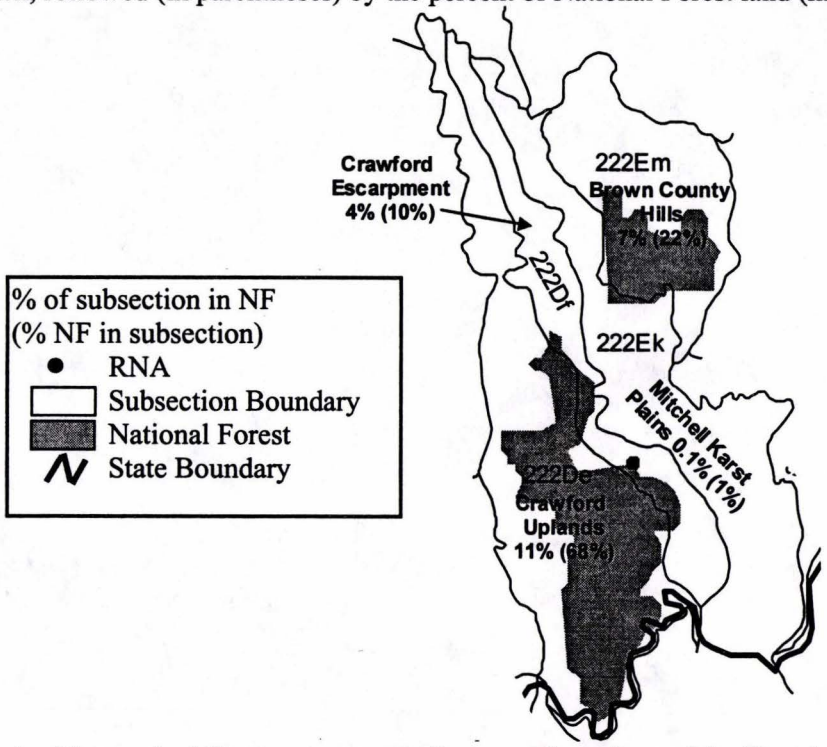
Hoosier Figure 1. Location of the Hoosier National Forest



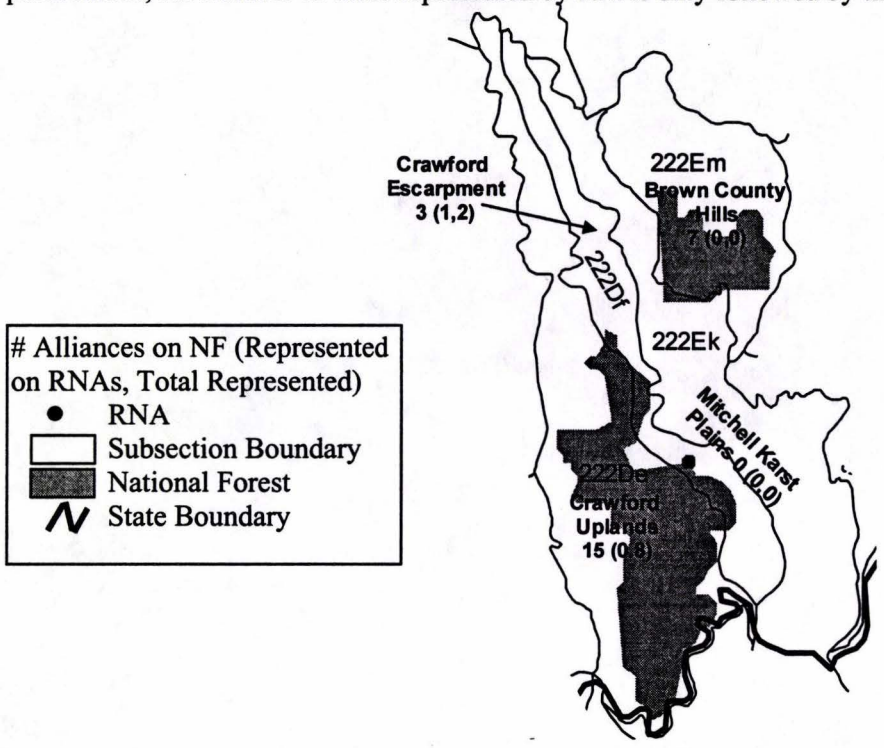
Hoosier Figure 2. The Hoosier National Forest with established RNAs and subsections
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Hoosier Figure 3. Hoosier National Forest in relation to subsections.
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percent of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percent of National Forest land (managed) in the subsection.



Hoosier Figure 4. Alliance representation on subsections of the Hoosier National Forest.
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on National Forest land, and in parentheses, the number of these represented by RNAs only followed by the total number represented.



HOOSIER APPENDICES

Hoosier Appendix A. Subsections of the Hoosier National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Hoosier Table 5 for information on the format of this table. The difference between these two tables is that Hoosier Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Hoosier Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of Hoosier NF

Community Pattern **Alliances not Reported on NF Land**		222De (CU)		222Em (BCH)		222Df (CE)		222Ek (MKP)	
Matrix Alliances	**Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Bald-cypress Semipermanently Flooded Forest Alliance			▪						
Large Patch Alliances	**Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance			▫		▪				▪
American Beech - Oak - Maple Forest Alliance									▪
Red Oak - Sugar Maple - (White Oak) Forest Alliance					▪				
White Oak - (Southern Red Oak, Post Oak) Forest Alliance			▪						
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance					▪ (1)				▪
Red Maple - Green Ash Seasonally Flooded Forest Alliance							▪		▪
Post Oak - Blackjack Oak Woodland Alliance			▪						
Small Patch Alliances	**Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Buttonbush Semipermanently Flooded Shrubland Alliance			▪		▪		▪		▪
Narrow-Leaf Willow Temporarily Flooded Shrubland Alliance							▫		▫
Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance							▪		▪
Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous Alliance								(1)	▪
Small Eroding Cliffs/Banks Sparse Vegetation				(1)	▪				

Hoosier Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Hoosier National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 222De. Crawford Uplands								
Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Bluffs Of Beaver Bend	196	BC	A	BC	B	
		Carnes Mill	100	CD	AC	B	BC	
		Fern Cliff Nature Preserve		C	U	BC	BC	
		Jug Rock Nature Preserve	27	D	C	BC	C	
		Plaster Creek/Pleasant Valley	42	D	CD	B	C	
		Saalman Hollow Nature Preserve		U	U	BC	U	
		Tank Spring Nature Preserve		U	U	BC	U	
		Virginia Saxifrage	40	D	AB	B	BC	
		Yellow Birch Ravine Nature Preserve	201	BC	C	BC	BC	
Black Oak - White Oak Forest Alliance		Bluffs Of Beaver Bend		U	U	BC	U	
		Bull Hollow Barrens	22	B	AC	B	B	
		Carnes Mill	34	C	CD	B	UU	
		Clover Lick Barrens	205	B	AC	B	B	
		Harding Flats	55	B	AC	B	B	
		Rockhouse Hollow	130	B	CD	B	UU	
		Wheatly Branch Barrens	90	CD	AB	B	B	
		Yellow Birch Ravine Nature Preserve		U	C	BC	BC	
White Oak - (Red Oak, Hickory species) Forest Alliance		Bluffs Of Beaver Bend	50	C	B	BC	BC	
		Bull Hollow Barrens ?	0				UU	?
		Clover Lick Barrens ?	0				UU	?
		Harding Flats ?	0				UU	?
		Rockhouse Hollow	35	D	AC	B	BC	
		Yellow Birch Ravine Nature Preserve		U	C	BC	BC	
Large Patch Alliances								
Eastern Hemlock - Yellow Birch Forest Alliance		Green's Bluff Nature Preserve ?	84	B	H	BC	QU	?
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance		Plaster Creek Seeps Nature Preserve		CD	B	BC	BC	
		Plaster Creek/Pleasant Valley	78	B	AB	B	B	
American Beech Temporarily Flooded Forest Alliance		Carnes Mill Nature Preserve	43	C	U	BC	BC	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
American Beech Temporarily Flooded Forest Alliance		Yellow Birch Ravine Nature Preserve	77	B	C	BC	BC	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Plaster Creek/Pleasant Valley	53	U	CD	B	C	
Chinquapin Oak Woodland Alliance		Shootingstar Cliffs		U	AC	B	B	
Small Patch Alliances								
Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance		Carnes Mill	60	B	CD	B	UU	
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance		Armstrong Glade Nature Preserve	14	B	B+	BC	B	
		Plaster Creek Seeps Nature Preserve	2	C	B	BC	B	
		Plaster Creek/Pleasant Valley	16	B	AC	B	B	
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance		Boone Creek Barrens	8	B	C+	BC	BC	
		Bull Hollow Barrens	10	B	B	B	B*	
		Clover Lick Barrens	35	B	B+	B	B	
		Harding Flats	10	B	B+	B	B	
		Rockhouse Hollow	5	B	B-	B	B	
		Wheatly Branch Barrens	10	B	B+	B	B	
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance		Plaster Creek Seeps Nature Preserve	9	B	BC	BC	BC	
		Plaster Creek/Pleasant Valley	10	B	AB	B	B	
Open Bluff/Cliff Sparse Vegetation		Bluffs Of Beaver Bend	10	B	A	BC	B	
		Carnes Mill	10	B	AB	B	B	
		Fern Cliff Nature Preserve		U	U	BC	U	
		Green's Bluff Nature Preserve		U	AB	BC	B	
		Jug Rock Nature Preserve	3	C	B	BC	B	
		Plaster Creek/Pleasant Valley	111	A	AB	B	B	
		Saalman Hollow Nature Preserve	58	AB	AB	BC	B	
		Tank Spring Nature Preserve		U	U	BC	U	
		Virginia Saxifrage	15	B	AC	B	B	
		Yellow Birch Ravine Nature Preserve		U	A	BC	B	
		Crawford Uplands (222De) Total:	1,958					

Subsection 222Em. *Brown County Hills*

Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Blue Bluff Nature Preserve ?	236	BC	H	BC	QU	?
		Crooked Creek Nature Preserve	29	D	AB	BC	BC	
		Ogle Hollow Nature Preserve	29	D	U	BC	C	
		Scout Ridge Nature Preserve ?	23	D	H	BC	QU	?
		Steele (Selma) Nature Preserve		U	U	BC	U	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
White Oak - (Red Oak, Hickory species) Forest Alliance		Crooked Creek Nature Preserve	29	D	C	BC	C	
		Hemlock Bluff Nature Preserve	40	CD	C	BC	C	
		Scout Ridge Nature Preserve	23	D	A	BC	BC	
		Steele (Selma) Nature Preserve		U	U	BC	U	
Large Patch Alliances								
Eastern Hemlock - Yellow Birch Forest Alliance		Hemlock Bluff Nature Preserve ?	40	C	H	BC	QU	?
Red Oak - Sugar Maple - (White Oak) Forest Alliance		Blue Bluff Nature Preserve ?	236	B	H	BC	QU	?
		Ogle Hollow Nature Preserve		U	U	BC	U	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance		Hitz - Rhodehamel Woods		U	U	BC	U	
		Steele (Selma) Nature Preserve		U	U	BC	U	
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		Hemlock Bluff Nature Preserve	40	C	C	BC	C	
Silver Maple Temporarily Flooded Forest Alliance		Hemlock Bluff Nature Preserve	40	C	C	BC	C	
Small Patch Alliances								
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance		Knobstone Glades Nature Preserve	5	C	BC	BC	BC	
Small Eroding Cliffs/Banks Sparse Vegetation		Blue Bluff Nature Preserve	6	B	U	BC	B*	
		Brown County Hills (222Em) Total:	776					

Subsection 222Df. *Crawford Escarpment*

Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Pioneer Mothers		80	C	AB	B	B	
		Bat Wing Cave Nature Preserve		U	U	BC	U	
		Dewey Hickman Nature Preserve	157	C	C	BC	C	
White Oak - (Red Oak, Hickory species) Forest Alliance	Pioneer Mothers ?		0	U	AB	B	QU	?
		Bat Wing Cave Nature Preserve	268	BC	B	BC	B	
		Pioneer Mothers Memorial Forest ?	140	C	AC	B	B*	?
		Post Oak - Cedar Nature Preserve		U	C	BC	BC	
		Scout Mountain Nature Preserve	45	CD	A	BC	B*	
Large Patch Alliances								
Chinquapin Oak Forest Alliance		Faucett Chapel	25	C	AC	B	B*	
Post Oak - Blackjack Oak Forest Alliance		Post Oak - Cedar Nature Preserve		U	C	BC	BC	
Small Patch Alliances								

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance		Post Oak - Cedar Nature Preserve		U	U	BC	U	
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance		Leavenworth Barrens Nature Preserve	51	AB	C+	BC	B*	
		Post Oak - Cedar Nature Preserve	18	B	B	BC	B	
Open Bluff/Cliff Sparse Vegetation		Deam (Charles C.) Nature Preserve		U	U	BC	U	
		Scout Mountain Nature Preserve	4	C	U	BC	U	
Cave		Bat Wing Cave Nature Preserve		U	U	BC	U	
		Orangeville Rise Of Lost River Nature Preserve		U	U	BC	U	
		Scout Mountain Nature Preserve		U	A	BC	B	
		Crawford Escarpment (222Df) Total:	788					

Subsection 222Ek. *Mitchell Karst Plains*

Matrix Alliances

American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Charles Spring Nature Preserve	347	BC	B	BC	B	
		Donaldson Cave Nature Preserve	54	C	C	BC	C	
		Donaldson's Woods Nature Preserve	65	C	AB	BC	B*	
		Griffy Woods Nature Preserve	150	C	U	BC	BC	
		Hayswood Nature Preserve	37	D	AB	BC	BC	
		Teeple Glade Nature Preserve	18	D	U	BC	BC	
		Wolf Cave Nature Preserve	247	BC	B	BC	B*	
Black Oak - White Oak Forest Alliance		Griffy Woods Nature Preserve		U	U	BC	U	
White Oak - (Red Oak, Hickory species) Forest Alliance		Big Spring Nature Preserve		U	U	BC	U	
		Cedar Bluffs Nature Preserve	78	C	U	BC	BC	
		Donaldson Cave Nature Preserve	54	C	C	BC	BC	
		Donaldson's Woods Nature Preserve	66	C	U	BC	BC	
		Hayswood Nature Preserve	37	D	C	BC	C	
		Teeple Glade Nature Preserve	7	D	U	BC	BC	
		Wolf Cave Nature Preserve		U	B	BC	B*	

Large Patch Alliances

Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance		Griffy Woods Nature Preserve		U	U	BC	U	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Bean Blossom Bottoms Nature Preserve	119	B	U	BC	B*	

Small Patch Alliances

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance		Donaldson Cave Nature Preserve	1	C C- BC	C
		Mosquito Creek Nature Preserve	5	B A BC	B
		Teeple Glade Nature Preserve	5	B A BC	B
Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous Alliance		Three-Way Sedge Sinkhole Swamp			B*
Open Bluff/Cliff Sparse Vegetation		Cedar Bluffs Nature Preserve	7	B U BC	B
		Charles Spring Nature Preserve	11	B C/B BC	B*
Cave		Charles Spring Nature Preserve	120	A B BC	B
		Donaldson Cave Nature Preserve		U A BC	B
		Mitchell Karst Plains (222Ek) Total:	1,428		
		Grand Total:	4,950		

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.

* Rank assignment is uncertain.

Hoosier Appendix C. Unrepresented alliances (Forest-wide) on the Hoosier National Forest

The following alliances are not represented in any of the subsections in which they occur on Hoosier land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix, widespread)
- American Beech Temporarily Flooded Forest Alliance (large patch, limited)
- Post Oak - Blackjack Oak Forest Alliance (large patch, widespread)
- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (large patch, widespread)
- Silver Maple Temporarily Flooded Forest Alliance (large patch, widespread)
- Little Bluestem - Poverty Grass Deciduous Wooded Herbaceous Alliance (small patch, limited)
- Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance (small patch, widespread)

Hoosier Appendix D. Existing and Proposed Special Areas of the Hoosier National Forest

Portions of Forest Service Special Areas (8.2) were identified as RNA-equivalents by Steve Olson, RNA Coordinator of Hoosier National Forest. The size of these RNA-equivalent portions are shown under the column "Current Level 1 Acres". (Level 1 areas are RNA-equivalents and are "highly-protected"; see Section II.A.) Shaded rows are areas that have not yet been designated as Special Areas; they have a 0 entered under Current Acres. Their proposed total size is shown in the Proposed Total Acres column, with Steve Olson's estimate of the Level 1 portion in the last column. These columns also show proposed additions to, *and subtractions from*, existing Special Areas. If these new areas and additions are officially designated, the alliances that occur in them may represent additional ecosystems (depending on RNA-equivalent status and the rank of each alliance occurrence).

Subsection	Name	Current Status		Proposed Status	
		Total Acres*	Level 1 Acres	Total Acres	Level 1 Acres
222De	Boone Creek Barrens	0	0	681	285
222De	Bull Hollow Barrens	32	32	251	210
222De	Buzzard Roost	0	0	?	?
222De	Carnes Mill	219	110	*no change proposed*	
222De	Clover Lick Barrens	240	240	1,407	410
222De	Harding Flats	65	65	605	130
222De	Horse Mill Branch	0	0	46	0
222De	Huron Woods	0	0	122	0
222De	Luke Knob	0	0	187	0
222De	Plaster Creek/ Pleasant Valley	440	310	558	310
222De	Rockhouse Hollow	170	40	201	40
222De	Shootingstar Cliffs†	6,210	600	5,822	600
222De	Stinking Fork Creek	0	0	732	0
222De	Tar Springs	0	0	77	0
222De	Virginia Saxifrage	55	55	171	?
222De	Wheatley Branch Barrens	100	100	170	130
222Em	Browning Hill	0	0	1,588	0
222Df	Beaver Creek	0	0	54	0
222Df	Dillon Cave	0	0	?	?
222Df	Faucett Chapel	40	25	89	25
222Df	Gypsy Bill Allen	0	0	79	0
222Df	Pioneer Mothers Memorial Forest	173	140	*no change proposed*	
222Df	Tincher Karst	3,705	?	4,305	?
222Ek	Wesley Chapel Gulf	0	0	187	0

* Proposed Special Areas have "0" current acres.

† Includes Hemlock Cliffs & Jubin Creek

IX. G. Huron-Manistee National Forest RNA Assessment

HURON-MANISTEE SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Huron-Manistee National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Huron-Manistee National Forest lands. The Huron-Manistee National Forest occupies portions of 14 subsections. Based on data from 12 of the 14 subsections, 61 alliances occur on Huron-Manistee lands, with the number of known alliances in each subsection ranging from 4 to 35. In these 12 subsections there are 280 alliance-subsection combinations on Huron-Manistee lands; these are the ecosystems to represent for the Huron-Manistee National Forest. Data still need to be compiled for 2 minor subsections: 222Ja and 222Jc.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Ten of the Huron-Manistee alliance-subsection combinations (ecosystems) are represented by the 3 currently established RNAs.

Existing **RNA-equivalents** in the 14 subsections include:

- 24 Michigan Natural Areas and
- 9 preserves of The Nature Conservancy.

These 33 RNA-equivalents, along with the 3 RNAs, currently represent 12 (4%) of the Huron-Manistee alliance-subsection combinations (ecosystems). The number of represented alliance-subsection combinations is probably larger because community data was unavailable for the Michigan Natural Areas. Identifying alliances in these areas could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTATED ECOSYSTEMS

Based on available data, the Huron-Manistee has 268 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing more RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in

which representation of biological diversity (alliances) is low, **high-priority subsections** for the Huron-Manistee National Forest are:

- Wellston Outwash and Ice Contact (212Hv)
- Newago Outwash and Ice Contact (212Hu)
- Hart Outwash and Lake Sands (212Hx)
- Tawas Lake Plain (212Hr)
- Cadillac End Moraines (212Hs), and
- Mio Outwash Plains (212Hq).

The Huron-Manistee has high prominence (>10%) in these subsections.

Medium-priority subsections are Harrisville Moraines (212Hm), Big Rapids Loamy Moraines (212Ht), Vanderbilt Moraines (212Hp), and Manistee Outwash and Lake Sands (212Hw). Huron-Manistee prominence in these subsections is 4-7%.

Low-priority subsections are Southeast Lake Michigan Plains and Dunes (222Ja), Kalkaska Moraines (212Hy), Iona Moraines (222Jc), and Cheboygon Lake Plain (212Hl), because Huron-Manistee prominence is at most 1% in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there are 14 **high-priority alliances** (of 61 Huron-Manistee alliances). These may be high-priority in each subsection in which they occur. Nine are not represented in *any* subsection in which they occur on Huron-Manistee land:

- Jack Pine - (Red Pine) Wooded Herbaceous Alliance
- Eastern Hemlock - Yellow Birch Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Black Oak - White Oak Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- White Oak - (Red Oak, Hickory species) Forest

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IX.G.1. INTRODUCTION

The Huron-Manistee National Forest is located in the lower peninsula of Michigan (Huron-Manistee Figure 1). The 2 portions of this National Forest (Huron and Manistee) are jointly administered. The proclamation boundaries contain 2,029,864 acres, with 972,365 acres (48%) of this land currently (FY97) managed by the Huron-Manistee.

The Huron-Manistee National Forest occurs almost entirely in Province 212 (Laurentian Mixed Forest Province). A small portion occurs in Province 222. Appendix VIII lists the other national forests in these provinces. The Huron-Manistee National Forest can work with the other national forests in each province to evaluate province-wide representation and establish priorities for the province.

IX.G.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Huron-Manistee.

IX.G.2.a. Subsections

A list of subsections for the Huron-Manistee National Forest was provided in the Huron-Manistee 1994 representative RNA pilot study (see Section V.A.). A couple additional subsections were added as the result of an overlay of a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo) on the digital subsection map of Keys *et al.* (1995).

We used these digital maps to determine the amount of land in each subsection within Huron-Manistee proclamation boundaries and purchase units. To estimate ownership acreage within each subsection, we multiplied these values by 48%, the fraction of ownership to proclamation acres for the entire Huron-Manistee National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with national forest land (ownership).

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percent of national forest land in a subsection gives an indication of the dominance of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.G.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Michigan, we first compiled the natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated to associations (one level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because only a subset of community occurrences are documented in the Heritage database, we sent the community lists to state Heritage and national forest ecologists, who added additional associations and alliances to each subsection list and provided additional information about the presence of alliances on national forest land. We were unable to obtain this information for subsections 222Ja and 222Jc. (The alliances that occur on Forest Service lands are the focus of the RNA assessment.)

IX.G.2.c. Identifying RNA-equivalents

RNA-equivalents were identified in discussions of ecologists of the USDA Forest Service, the Michigan Natural Features Inventory, and the authors. Michigan Natural Areas (MNAs) that qualify as RNA-equivalents were selected by Kim Herman of the Michigan Natural Features Inventory. The RNA Committee of the Huron-Manistee National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.G.2.d. Digitizing RNAs

The Huron-Manistee provided USGS 7.5 minute (1:24,000 scale) topographical maps with outlines of RNA boundaries. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Huron-Manistee RNAs (Huron-Manistee Figure 2) in the projection used by the Huron-Manistee (Michigan Stateplane Fipszone 6376, NAD 27, feet), or a Lake States or Region-wide RNA cover at regional projections.

IX.G.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All Huron-Manistee RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

Kim Herman of the Michigan Natural Features Inventory provided us with a list of Michigan Natural Areas, with total acreage and subsection for each area. We were unable to obtain community information, except for the few sites with Element Occurrences (EOs) recorded in the Michigan Heritage database. In these cases the acres assigned to the type are the size of the EO, which may not be entirely contained by the Natural Area.

Complete community information for Michigan TNC preserves was provided by Doug Pearsall of the Michigan Field Office of The Nature Conservancy and reviewed by Pat Comer of Michigan Natural Features Inventory.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Huron-Manistee Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Huron-Manistee; answered questions may result in additional represented alliance-subsection combinations.

IX.G.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Huron-Manistee National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.G.3.a. Subsections on national forest land

The 14 subsections which occur on Huron-Manistee land are listed below (Huron-Manistee Figure 2). These subsections are listed in order of *prominence*, the percent of the subsection on national forest land.

- Newago Outwash and Ice Contact (212Hu)
- Wellston Outwash and Ice Contact (212Hv)
- Mio Outwash Plains (212Hq)
- Hart Outwash and Lake Sands (212Hx)
- Tawas Lake Plain (212Hr)
- Cadillac End Moraines (212Hs)
- Vanderbilt Moraines (212Hp)
- Manistee Outwash and Lake Sands (212Hw)
- Harrisville Moraines (212Hm)
- Big Rapids Loamy Moraines (212Ht)
- Southeast Lake Michigan Plains and Dunes (222Ja)
- Kalkaska Moraines (212Hy)
- Iona Moraines (222Jc)
- Cheboygon Lake Plain (212Hl)

The majority of the Huron-Manistee occurs on four subsections (Huron-Manistee Table 4, Huron-Manistee Figure 3): Newago Outwash and Ice Contact (212Hu, 24% of national forest land), Mio Outwash Plains (212Hq, 21%), Tawas Lake Plain (212Hr, 11%), and Wellston Outwash and Ice Contact (212Hv, 10.7%). In addition, large portions of two of these subsections are managed by Huron-Manistee—31% of 212Hu and 18% of 212Hv—*i.e.*, the Huron-Manistee has high *prominence* of land coverage in these subsections. Between 10 and 13% of the two other subsections, 212Hq and 212Hr, are managed by Huron-Manistee. A similar proportion of the Hart Outwash and Lake Sands (212Hx) and Cadillac End Moraines (212Hs) are managed by Huron-Manistee, but less than 7% of the Huron-Manistee occurs in each of these subsections.

The remaining eight subsections each occupy less than 7% of Huron-Manistee land (Huron-Manistee Table 4), and less than 7% of each is managed by the Huron-Manistee.

IX.G.3.b. Natural communities within subsections

A total of 76 alliances are reported to occur in these 14 subsections. Of these, 61 are known to be on national forest land (Huron-Manistee Table 5, first column); the 15 alliances not reported to occur on national forest land are listed in Huron-Manistee Appendix A.

Of the 61 alliances occurring on the Huron-Manistee, 14 are **matrix** alliances (see Huron-Manistee Table 5, first set of alliances), 31 are **large patch** (second set) and 16 are **small patch** (third set). (See "National Vegetation Classification," pp. 8-9.)

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on national forest land in each subsection:

- Newago Outwash and Ice Contact (212Hu): 28 alliances (6 matrix, 16 large patch, 6 small patch)
- Wellston Outwash and Ice Contact (212Hv): 33 alliances (9 matrix, 18 large patch, 6 small patch)
- Mio Outwash Plains (212Hq): 32 alliances (9 matrix, 17 large patch, 6 small patch)
- Hart Outwash and Lake Sands (212Hx): 27 alliances (7 matrix, 15 large patch, 5 small patch)
- Tawas Lake Plain (212Hr): 32 alliances (9 matrix, 16 large patch, 7 small patch)
- Cadillac End Moraines (212Hs): 25 alliances (5 matrix, 14 large patch, 6 small patch)
- Vanderbilt Moraines (212Hp): 21 alliances (7 matrix, 11 large patch, 3 small patch)
- Manistee Outwash & Lake Sands (212Hw): 35 alliances (8 matrix, 17 large patch, 10 small patch)
- Harrisville Moraines (212Hm): 10 alliances (2 matrix, 5 large patch, 3 small patch)
- Big Rapids Loamy Moraines (212Ht): 24 alliances (5 matrix, 12 large patch, 7 small patch)

- SE Lake Michigan Plains & Dunes (222Ja): *unknown*
- Kalkaska Moraines (212Hy): 8 alliances (3 matrix, 4 large patch, 1 small patch)
- Iona Moraines (222Jc): 1 alliance (1 small patch)
- Cheboygon Lake Plain (212Hl): 4 alliances (1 matrix, 2 large patch, 1 small patch)

There are a total of 280 subsection-alliance combinations on national forest land. Huron-Manistee Table 5 shows the alliances that occur in each subsection.

IX.G.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents. The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Huron-Manistee Table 6. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Huron-Manistee Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

The Huron-Manistee National Forest has established 3 RNAs (Huron-Manistee Tables 1 and 6). There are 15 proposed and candidate RNAs (cRNAs), but these are not included in this assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs on the Huron-Manistee (Huron-Manistee Figure 2) is available in the projection used by the Huron-Manistee (Michigan Stateplane Fipszone 6376, NAD 27, feet) from the Regional RNA Coordinator. A Lake States national forests RNA cover is also available.

RNA-equivalents

Ottawa, Hiawatha, Huron-Manistee National Forest and Michigan Natural Features Inventory personnel have agreed that the following areas are RNA-equivalents (Huron-Manistee Table 2) in Michigan:

- Michigan Natural Areas (MNAs) on state-owned land that are documented and secure, and
- all of The Nature Conservancy's (TNC) preserves.

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Huron-Manistee Table 3, Huron-Manistee Appendix D). Huron-Manistee personnel can work with conservation partners to find additional RNA-equivalents. In Michigan at present, no portions of State Forests, State Parks, State Wayside, or Wildlife Management Areas are RNA-equivalents. If the legal protection status (including management directives) of these areas is increased, then they could be reconsidered for RNA-equivalency.

Nine TNC preserves and 24 Michigan Natural Areas serve as RNA-equivalents for the Huron-Manistee assessment (Huron-Manistee Table 6, 7a). We were unable to obtain community data for the Michigan Natural Areas. As a result there is likely to be a higher number of represented ecosystems than indicated below.

Subsection 212Hu (Newago Outwash and Ice Contact)

Subsection 212Hu contains 1 RNA covering 180 acres (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Newago Prairies.

The subsection also contains 1 TNC preserve, covering 80 acres:

- Ore-Ida Prairie.

Thus 0.1% of the subsection is protected by RNAs and RNA-equivalents (Huron-Manistee Table 7a).

Natural communities (alliances)

Of 28 alliances reported to be on national forest land in Subsection 212Hu, 4 are represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Huron-Manistee Table 5, column 212Hu; Huron-Manistee Table 7b; Huron-Manistee Figure 4). Of 6 **matrix** alliances, 1 is represented, and of 16 **large patch** alliances, 3 are represented. None of the 6 **small patch** alliances are represented.

Subsection 212Hv (Wellston Outwash and Ice Contact)

Subsection 212Hv contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 9 **matrix**, 18 **large patch**, and 6 **small patch** alliances reported from national forest land is represented (Huron-Manistee Table 5, column 212Hv; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

Subsection 212Hq (Mio Outwash Plains)

Subsection 212Hq contains no RNAs, but does contain 4 Michigan Natural Areas (Huron-Manistee Tables 6, 7a; Huron-Manistee Figure 3):

- Crawford Red Pines Site* (17)
- Dead Stream Swamp* (11,680)
- Roscommon Red Pines (160)
- South Branch Au Sable River Area* (5,980).

Therefore, 17,837 acres (1%) of the subsection are protected by RNA-equivalents (Huron-Manistee Table 7a).

Natural communities (alliances)

Of 32 alliances reported to be on national forest land in Subsection 212Hq, 1 is currently represented by a high-quality (A- or B-ranked) occurrence on a Michigan Natural Area (Huron-Manistee Table 5, column 212Hq; Huron-Manistee Table 7b; Huron-Manistee Figure 4). Of 9 **matrix** alliances, 1 is represented, but none of the 17 **large patch** alliances or 6 **small patch** alliances is represented. Additional alliances may be represented on the Michigan Natural Areas, but complete community data were not available.

Subsection 212Hx (Hart Outwash and Lake Sands)

Subsection 212Hx contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 7 **matrix**, 15 **large patch**, and 5 **small patch** alliances reported from national forest land are represented (Huron-Manistee Table 5, column 212Hx; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

* No community data available at this time.

Subsection 212Hr (Tawas Lake Plain)

Subsection 212Hr contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 9 **matrix**, 16 **large patch**, and 7 **small patch** alliances reported from national forest land are represented (Huron-Manistee Table 5, column 212Hx; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

Subsection 212Hs (Cadillac End Moraines)

Subsection 212Hs contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 5 **matrix**, 14 **large patch**, and 6 **small patch** alliances reported from national forest land are represented (Huron-Manistee Table 5, column 212Hx; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

Subsection 212Hp (Vanderbilt Moraines)

Subsection 212Hp contains 1 RNA, covering 388 acres (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Hayes Tower

and 3 Michigan Natural Areas:

- Jordan River Area* (1,830)
- Pigeon River-Grindstone Creek* (160)
- Pigeon River-Pine Tract* (220).

Thus, 2,598 acres (0.3%) of the subsection are protected by RNAs and RNA-equivalents (Huron-Manistee Table 7a).

Natural communities (alliances)

Of 21 alliances reported to be on national forest land in Subsection 212Hp, 2 are currently represented by high-quality (A- or B-ranked) occurrences on the RNA (Huron-Manistee Table 5, column 212Hp; Huron-Manistee Table 7b; Huron-Manistee Figure 4). None of the 7 **matrix** alliances or 3 **small patch** alliances are represented. Two of the 11 **large patch** are represented. Additional alliances may be represented on the Michigan Natural Areas, but complete community data were not available.

Subsection 212Hw (Manistee Outwash and Lake Sands)

Subsection 212Hw contains 1 RNA, covering 795 acres (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Nordhouse Dunes,

1 Michigan Natural Area:

- Ludington St. Park* (4,520),

and 2 TNC preserves:

- Pt. Betsie (99)
- Tower Troy (24).

Thus, 5,438 acres (1%) of the subsection are protected by RNAs and RNA-equivalents (Huron-Manistee Table 7a).

* No community data available at this time.

Natural communities (alliances)

Of 35 alliances reported to be on national forest land in Subsection 212Hw, 5 are currently represented by high-quality (A- or B-ranked) occurrences on at least 1 RNA or RNA-equivalent (Huron-Manistee Table 5, column 212Hw; Huron-Manistee Table 7b; Huron-Manistee Figure 4). Of the 8 **matrix** alliances, 2 are represented, of 17 **large patch** alliances, 2 are represented, and of 10 **large patch** alliances, 1 is represented. Additional alliances may be represented on the Michigan Natural Area, but complete community data were not available.

Subsection 212Hm (Harrisville Moraines)

Subsection 212Hm contains no RNAs, but does contain 1 Michigan Natural Area, covering 680 acres (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Pigeon River-Dog Lake*

Thus, 0.05% of the subsection is protected by an RNA-equivalent (Huron-Manistee Table 7a).

Natural communities (alliances)

The 2 **matrix**, 5 **large patch**, and 3 **small patch** alliances reported from national forest land in Subsection 212Hm are not currently represented by high-quality (A- or B-ranked) occurrences (Huron-Manistee Table 5, column 212Hm; Huron-Manistee Table 7b; Huron-Manistee Figure 4). Some alliances may be represented on the Michigan Natural Area, but complete community data were not available.

Subsection 212Ht (Big Rapids Loamy Moraines)

Subsection 212Ht contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 5 **matrix**, 12 **large patch**, and 7 **small patch** alliances reported from national forest land are represented (Huron-Manistee Table 5, column 212Ht; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

Subsection 222Ja (Southeast Lake Michigan Plains and Dunes)

Subsection 222Ja contains no RNAs, but does contain 8 Michigan Natural Areas (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Allegan Pine Plains* (160)
- Crooked Lake Marsh* (186)
- Grand Mere* (1,564)
- Hoffmaster Wild Area (246)
- Muskegon Dunes & Swales* (330)
- Saugatuck Dunes Natural Area* (291)
- Warren Dunes Nature Study Area* (488)
- Warren Woods* (312)

and 4 preserves of The Nature Conservancy:

- Grand Beach Marsh (11)
- Robinson Woods (80)
- Ross (1,423)
- Schwark Road Prairie (3.4).

Thus, 5,094 (1%) acres of the subsection are protected by RNA-equivalents (Huron-Manistee Table 7a).

* No community data available at this time.

Natural communities (alliances)

An assessment of this subsection cannot be performed due to lack of data. The alliances on national forest land in this subsection have yet to be identified.

Subsection 212Hy (Kalkaska Moraines)

Subsection 212Hy contains no RNAs or RNA-equivalents (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3). Therefore, none of the 3 **matrix**, 4 **large patch**, and 1 **small patch** alliances reported from national forest land are represented (Huron-Manistee Table 5, column 212Hy; Huron-Manistee Table 7b; Huron-Manistee Figure 4).

Subsection 222Jc (Iona Moraines)

Subsection 222Jc contains no RNAs, and it is not known whether it contains any RNA-equivalents (Huron-Manistee Table 6). An assessment of this subsection cannot be performed due to lack of data; only one (unrepresented) alliance has been identified on the estimated 3,522 acres of Huron-Manistee land in this subsection (Huron-Manistee Table 7b).

Subsection 212Hl (Cheboygon Lake Plain)

Subsection 212Hl contains no RNAs, but does contain 7 Michigan Natural Areas (Huron-Manistee Table 6, 7a; Huron-Manistee Figure 3):

- Besser Natural Area* (134)
- Duck-Mud Lake Chain Site* (253)
- Lake Sixteen* (133)
- Thompson's Harbor Natural Area (260)
- Wilderness St. Park* (508)
- Wilderness St. Park Hardwood State Forest* (5,161)
- Wilderness St. Park Natural Area* (932)

Thus, 8,165 acres (2%) of the subsection are protected by RNA-equivalents (Huron-Manistee Table 7a).

Natural communities (alliances)

The 1 **matrix**, 2 **large patch**, and 1 **small patch** alliances reported from national forest land in Subsection 212Hl are not currently represented by high-quality (A- or B-ranked) occurrences (Huron-Manistee Table 5, column 212Hl; Huron-Manistee Table 7b; Huron-Manistee Figure 4). One unrepresented large patch alliances has a low quality occurrence on Squaw Bay TNC preserve and its quality/viability should be verified:

- Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance

Some alliances may be represented on the Michigan Natural Areas, but complete community data were not available.

IX.G.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Huron-Manistee National Forest (H-M NF). The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the

* No community data available at this time.

subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Huron-Manistee Table 5 by shaded cells which contain no number. Alliances that are not represented in any Huron-Manistee subsection (unrepresented Forest-wide) are listed in Huron-Manistee Appendix C.

Subsection	Dominance Percentage of H-M NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on H-M NF land	Percentage of NF alliances represented	Proposed priority
212Hv. Wellston Outwash and Ice Contact	10.7	0	18	0	high
212Hu. Newago Outwash and Ice Contact	24	0.1	31	14	high
212Hx. Hart Outwash and Lake Sands	5.4	0	12.6	0	high
212Hr. Tawas Lake Plain	11	0	11.8	0	high
212Hs. Cadillac End Moraines	6	0	10.1	0	high
212Hq. Mio Outwash Plains	21	1	12.7	3	high
212Hm. Harrisville Moraines	6.2	0.05	4.8	0	medium
212Ht. Big Rapids Loamy Moraines	6	0	4.6	0	medium
212Hp. Vanderbilt Moraines	6.3	0.3	6.7	10	medium
212Hw. Manistee Outwash and Lake Sands	2.2	1	5.6	14	medium
222Ja. Southeast Lake Michigan Plains and Dunes	0.4	1	1.0	?	low
212Hy. Kalkaska Moraines	0.13	0	0.13	0	low
222Jc. Iona Moraines	0.36	?	0.1	?	low
212Hl. Cheboygon Lake Plain	0.02	2	0.03	0	low

In all subsections fewer than 15% of the alliances are represented, which means that, based on the need for alliance representation, all subsections are relatively high priority for future RNA establishment. An alternative approach to prioritization is to use prominence—the percent of a subsection on Forest Service land. Using this approach, the 6 subsections with greater than 10% prominence are considered high priority. Subsections 212Hv and 212Hu are higher priority than 212Hx, 212Hr, 212Hs, and 212Hq because they have higher prominence. With 4-7% prominence, Subsections 212Hm, 212Ht, 212Hp, and 212Hw are medium priority. Subsections 212Hp and 212Hw have slightly higher prominence, but they are lower priority than 212Hm and 212Ht because 10% and 15% of their alliances, respectively, are already represented. Low priority subsections include 222Ja, 212Hy, 222Jc, and 212Hl, with at most 1% prominence.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented. Many alliances may be identified as unrepresented simply due to lack of information on some RNA-equivalents.

Subsection 212Hv (Wellston Outwash and Ice Contact)

None of the 33 alliances are represented (Huron-Manistee Figure 3). The 9 matrix alliances may be highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

Subsection 212Hu (Newago Outwash and Ice Contact)

Of 28 alliances, 4 are represented, leaving 24 (86%) in need of representation (Huron-Manistee Figure 3).

The 5 unrepresented matrix alliances may be highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

Subsection 212Hx (Hart Outwash and Lake Sands)

None of 26 alliances are represented (Huron-Manistee Figure 3). The 7 matrix alliances may be highest priority for RNA establishment:

- Jack Pine Forest Alliance
- White Pine Forest Alliance
- Black Oak - White Oak Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- White Oak - (Red Oak, Hickory species) Forest
- Quaking Aspen - Paper Birch Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

Subsection 212Hr (Tawas Lake Plain)

None of 33 alliances are represented (Huron-Manistee Figure 3). The 9 matrix alliances may be highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

Subsection 212Hs (Cadillac End Moraines)

None of 25 alliances are represented (Huron-Manistee Figure 3). The 5 matrix alliances may be highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Hq (Mio Outwash Plains)

Of 32 alliances, 1 is represented, leaving 31 (97%) alliances in need of representation (Huron-Manistee Figure 3).

The 8 unrepresented matrix alliances may be highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Jack Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Areas, for which we currently have no community data:

- Crawford Red Pine Site
- Dead Stream Swamp
- Roscommon Red Pines
- South Branch Au Sable River Area

Subsection 212Hm (Harrisville Moraines)

None of 10 alliances are represented (Huron-Manistee Figure 3). The 2 matrix alliances may be highest priority for RNA establishment:

- White Pine Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Area, for which we currently have no community data:

- Pigeon River - Dog Lake

Subsection 212Ht (Big Rapids Loamy Moraines)

None of 24 alliances are represented (Huron-Manistee Figure 3). The 5 matrix alliances may be highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine Forest Alliance

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Hp (Vanderbilt Moraines)

Of 21 alliances, 2 are represented, leaving 19 (90%) alliances in need of representation (Huron-Manistee Figure 3).

The 7 unrepresented matrix alliances may be highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Areas, for which we currently have no community data:

- Jordan River Area
- Pigeon River-Grindstone Creek
- Pigeon River-Pine Tract

Subsection 212Hw (Manistee Outwash and Lake Sands)

Of 35 alliances, 5 are represented, leaving 30 (86%) alliances in need of representation (Huron-Manistee Figure 3).

The 6 unrepresented matrix alliances may be highest priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Black Oak - White Oak Forest Alliance
- Jack Pine - (Red Pine) Wooded Herbaceous Alliance* (Pt. Betsie & Tower Troy TNC preserves)

The marked (*) alliance has a low quality occurrence on TNC preserves. The quality/viability of these occurrences should be verified.

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Area, for which we currently have no community data:

- Ludington State Park

Subsection 222Ja (Southeast Lake Michigan Plains and Dunes)

Alliances have yet to be identified on the national forest land in this subsection.

Subsection 212Hy (Kalkaska Moraines)

None of 8 alliances are represented (Huron-Manistee Figure 3). The 3 matrix alliances may be highest priority for RNA establishment:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance
- Little Bluestem - Indian Grass Herbaceous Alliance

Subsection 222Jc (Iona Moraines)

The 1 alliance identified for this subsection is not represented. Further work is needed to determine the complete list of alliances on national forest land in this subsection and to identify RNA-equivalents for the subsection.

Subsection 212Hl (Cheboygon Lake Plain)

None of 4 alliances are represented (Huron-Manistee Figure 3). The 1 matrix alliance may be highest priority for RNA establishment:

- Jack Pine Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Areas, for which we currently have no community data:

- Besser Natural Area
- Duck-Mud Lake Chain Site
- Lake Sixteen
- Thompson's Harbor Natural Area
- Wilderness State Park
- Wilderness State Park Hardwood State Forest
- Wilderness State Park Natural Area

HURON-MANISTEE TABLES

Huron-Manistee Table 1. Established research natural areas (RNAs) of the Huron-Manistee National Forest

RNA	Acres	Subsection	Established
Hayes Tower	388	212Hp	1997
Newago Prairies	180	212Hu	1988
Nordhouse Dunes	795	212Hw	1987

Huron-Manistee Table 2. Designations identified to date as RNA-equivalents for the Huron-Manistee National Forest

Protected Area Designation	Managed by
Michigan Natural Areas on State Owned Land that are Documented and Secure* (MNAs)	Michigan Department of Natural Resources
The Nature Conservancy (TNC) Preserves	The Nature Conservancy (private)

*As selected by Kim Herman of Michigan Natural Features Inventory

Huron-Manistee Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Huron-Manistee National Forest

The Huron-Manistee may work with these organizations to consider RNA-equivalency (see Methods).

Protected Area Designation	Managed by
Wilderness Areas National Scenic Rivers National Recreation Areas Ecological Study Areas	US Forest Service
Environmental Areas	Great Lakes Program
National Parks & Lakeshores	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy: Michigan Nature Association, Little Traverse Conservancy, Cranbrook Institute Nature Preserve
Research Natural Areas	US Fish & Wildlife Service Michigan Parks and Recreation
Quiet Areas	Michigan Forest Management Division
Wilderness State Park	Michigan Parks and Recreation
Critical Dune Area	Land & Water Management
University preserves	University of Michigan, private Universities

* See Huron-Manistee Appendix D for listing of some specific areas within these categories.

Huron-Manistee Table 4. Subsections of the Huron-Manistee National Forest, in order of prominence

"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Huron-Manistee NF total ownership, and these percents do add to 100, within rounding error. All values are approximate. See also Huron-Manistee Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF in subsection
212Hu--Newago Outwash and Ice Contact	734,074	231,074	31	24
212Hv--Wellston Outwash and Ice Contact	567,362	104,220	18	10.7
212Hq--Mio Outwash Plains	1,601,958	203,834	12.7	21
212Hx--Hart Outwash and Lake Sands	417,087	52,712	12.6	5.4
212Hr--Tawas Lake Plain	938,897	111,222	11.8	11
212Hs--Cadillac End Moraines	578,779	58,744	10.1	6.04
212Hp--Vanderbilt Moraines	906,054	60,921	6.7	6.3
212Hw--Manistee Outwash and Lake Sands	388,838	21,601	5.6	2.2
212Hm--Harrisville Moraines	1,263,065	60,708	4.8	6.2
212Ht--Big Rapids Loamy Moraines	1,266,785	58,442	4.6	6.01
222Ja--Southeast Lake Michigan Plains and Dunes	388,524	3,980	1.0	0.4
212Hy--Kalkaska Moraines	977,034	1,239	0.13	0.13
222Jc--Iona Moraines	3,672,909	3,522	0.1	0.36
212Hl--Cheboygon Lake Plain	540,047	146	0.03	0.02
Huron-Manistee NF total ownership:		972,365		

Huron-Manistee Table 5. Subsections and alliances of the Huron-Manistee National Forests (NF) and their representation by RNAs and RNA-equivalents.
Alliances are listed by their community pattern (matrix, large patch, and small patch), and subsections are sorted by NF prominence (see Huron-Manistee Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) NOI= Newaygo Outwash and Ice Contact, WOI= Wellston Outwash and Ice Contact, MOP= Mio Outwash Plains, HOL= Hart Outwash and Lake Sands, CEM= Cadillac End Moraines, TLP=Tawas Lake Plain, VM= Vanderbilt Moraines, MOL= Manistee Outwash and Lake Sands, HM= Harrisville Moraines, BRM= Big Rapids Loamy Moraines, SLM= Southeast Lake Michigan Plains and Dunes, KM= Kalkaska Moraines, IM= Iona Moraines, CLP= Cheboygon Lake Plain. For a list of alliances occurring in subsections of the Huron-Manistee NF but not reported on NF land, see Huron-Manistee Appendix A. For alliance nomenclature, see

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances Reported on NF Land**	212Hu (NOI)		212Hv (WOI)		212Hq (MOP)		212Hx (HOL)		212Hr (TLP)		212Hs (CEM)		212Hp (VM)		212Hw (MOL)		212Hm (HM)		212Ht (BRM)		222Ja* (SLM)		212Hy (KM)		222Jc* (IM)		212Hl (CLP)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance			▪		▪		▪		▪		▪		▪		▪		▪		▪								▪	
Eastern White Pine - Eastern Hemlock Forest Alliance	▫		▪		▪		▪		▪				▪		▪		▪						▪				▪	
Jack Pine Forest Alliance	▪		▪		▪		▪		▪		▪		▪		1 ▪	(1)	▪		▪				▪				▪	
Red Pine Forest Alliance	▪		▪		(1) ▪		▪		▪		▪		▪		▪		▪		▪				▪				▪	
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	▪		▪		▪		▫		▪		▪		▪		▪		▪		▪				▪				▪	
White Pine Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪		▪		▪				▪				▪	
White Spruce - Balsam Fir - Aspen Forest Alliance			▪		▪				▪		▪		▪		▪		▪										▪	
White Spruce - Balsam Fir Forest Alliance			▫						▪		▫				▪		▪										▪	
Black Oak - White Oak Forest Alliance	▪						▪								▪				▪		▫							
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	▪		▪		▪		▪		▪		▪		▪		1 ▪	(1)	▪		▪		▪		▪				▪	

* We were unable to obtain data about alliances on national forest land in these subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus some RNA-equivalents in 222Ja. We were unable to identify RNA-equivalents for 222Jc.

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances Reported on NF Land**	212Hu (NOI)	212Hv (WOI)	212Hq (MOP)	212Hx (HOL)	212Hr (TLP)	212Hs (CEM)	212Hp (VM)	212Hw (MOL)	212Hm (HM)	212Ht (BRM)	222Ja* (SLM)	212Hy (KM)	222Jc* (IM)	212Hl (CLP)
White Oak - (Red Oak, Hickory species) Forest Alliance	▪			▪						▪	(1) ▪		▪	
Quaking Aspen - Paper Birch Forest Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪		▪
Jack Pine - (Red Pine) Wooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪(1)	▪					
Little Bluestem - Indian Grass Herbaceous Alliance	1 ▪											▪		

Large Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Jack Pine - Oak (Northern Pin, Black) Forest Alliance	▪		▪		▪				▪		▪		▪		▪		▪		▪				▪			
Northern White Cedar Forest Alliance			▪				▪		▪				▪(1)													▪
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	1 (1)	▪	▪		▪		▪		▪		1	▪	▪		▪		▪		▪		▪		▪		▪	
Red Oak - Sugar Maple - (White Oak) Forest Alliance		▪	▪		▪			▪			1	▪	(1)	▪(1)	▪		▪		(1)	▪	▪		▪		▪	
Sugar Maple - White Ash - American Basswood Forest Alliance					▪																▪					▪
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	▪			▪	▪		▪								▪		▪				▪		▪			
Silver Maple Temporarily Flooded Forest Alliance	▪		▪		▪								▪		▪		▪				▪					
Black Spruce - Tamarack Saturated Forest Alliance	▪			▪			▪																			
Black Spruce Saturated Forest Alliance	▪		▪		▪		▪		▪		▪		▪													▪
Northern White Cedar - Red Maple Saturated Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪		▪								▪	▪
Northern White Cedar Saturated Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪		▪				▪		▪		(1)	▪(1)
Black Ash - Red Maple Saturated Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪		▪				▪					▪
Tamarack Saturated Forest Alliance	▪		▪		▪		▪		▪		▪		▪		▪		▪				▪					▪
Black Spruce Saturated Woodland Alliance			▪		▪		▪		▪		▪		▪								▪					

* We were unable to obtain data about alliances on national forest land in these subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus some RNA-equivalents in 222Ja. We were unable to identify RNA-equivalents for 222Jc.

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances Reported on NF Land**	212Hu (NOI)	212Hv (WOI)	212Hq (MOP)	212Hx (HOL)	212Hr (TLP)	212Hs (CEM)	212Hp (VM)	212Hw (MOL)	212Hm (HM)	212Ht (BRM)	222Ja* (SLM)	212Hy (KM)	222Jc* (IM)	212Hl (CLP)
White Oak - (Black Oak) Woodland Alliance	▪	▪	▪	▪	▪		▪	▪		▪				
White Pine - Oak (White, Red) Wooded Herbaceous Alliance	1 ▪	▪	▪	▪	▪	▪		▪				▪	▪	
Buttonbush Semipermanently Flooded Shrubland Alliance		▪												
Speckled Alder Seasonally Flooded Shrubland Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪		▪
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance	▪	▪	▪	▪	▪	▪	▪	▪		▪		▪		▪
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪		▪
American Beachgrass Herbaceous Alliance				▪	▪			1 ▪	▪		▪			▪ (1)
Little Bluestem - (Sand Dropseed) Herbaceous Alliance	1 ▪ (1)	▪	▪	▪	▪					▪		▪		
Prairie Cordgrass Temporarily Flooded Herbaceous Alliance	▪	▪											▪	
Canada Bluejoint Seasonally Flooded Herbaceous Alliance				▪		▪								
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance		▪				▪			▪					
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	(1) ▪	▪		▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪ (1)
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪			▪		▪
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance	▪	▪		▪	▫	▪	▫	▪	▪	▫		▪		▪
Herbaceous Dunes Sparse Vegetation				▪	▪			(2) ▪	▪					▪
Northern White Cedar Complex					▪			▪	▪					(2) ▪
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Eastern Hemlock Saturated Forest Alliance	▪	▫			▪			▪	▪	▪	▪			▪

* We were unable to obtain data about alliances on national forest land in these subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus some RNA-equivalents in 222Ja. We were unable to identify RNA-equivalents for 222Jc.

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances Reported on NF Land**	212Hu (NOI)	212Hv (WOI)	212Hq (MOP)	212Hx (HOL)	212Hr (TLP)	212Hs (CEM)	212Hp (VM)	212Hw (MOL)	212Hm (HM)	212Ht (BRM)	222Ja* (SLM)	212Hy (KM)	222Jc* (IM)	212Hl (CLP)
White Pine - (Red Maple) Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪		▪
(Jack Pine, Red Pine) Woodland Alliance	▪	▪	▪		▪	▪	▪	▪		▪		▪		
Common Juniper Shrubland Alliance								▪						
Bog Birch - (Willow) Saturated Shrubland Alliance			▪				▪		▪			▪		▪
Shrubby Cinquefoil - Sweetgale - (Wire Sedge) Saturated Shrubland Alliance								1 ▪						
Big Bluestem - (Indian Grass) Herbaceous Alliance				▪								▪		
Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous Alliance	▪	▪		▪							(2) ▪		▪	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪		▪		▪		▪		
Twig Rush Seasonally Flooded Herbaceous Alliance				▪	▪			▪						▪ (1)
Wiregrass Sedge Saturated Herbaceous Alliance		▪	▪	▪	▪	▪		▪	▪	▪		▪		(3) ▪
Skunk Cabbage - Marsh Marigold Saturated Herbaceous Alliance	▪	▫	▪	▫	▪	▪		▫	▪	▪				▫
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪
Open Bluff/Cliff Sparse Vegetation													▪	▪
Northern Sea Rocket Sparsely Vegetated Alliance								▪						
Sand Flats Temporarily Flooded Sparse Vegetation			▪	▪				▪	▪					▪

* We were unable to obtain data about alliances on national forest land in these subsections. The data shown are from Element Occurrences in the Michigan Heritage database, plus some RNA-equivalents in 222Ja. We were unable to identify RNA-equivalents for 222Jc.

Huron-Manistee Table 6. RNAs and RNA-equivalents of the Huron-Manistee National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)	
		Michigan Natural Areas	TNC Preserves
212Hu	Newago Prairies (180)		Ore-Ida Prairie (80)
212Hv			
212Hq		Crawford Red Pines Site§ (17) Dead Stream Swamp§ (11,680) Roscommon Red Pines (160) South Branch Au Sable River Area§ (5,980)	
212Hs			
212Hr			
212Hx			
212Hp	Hayes Tower (388)	Jordan River Area§ (1,830) Pigeon River-Grindstone Creek§ (160) Pigeon River-Pine Tract§ (220)	
212Hw	Nordhouse Dunes (795)	Ludington St. Park§ (4,520)	Pt. Betsie (99) Tower Troy (24)
212Hm		Pigeon River-Dog Lake§ (680)	
212Ht			
222Ja		Allegan Pine Plains§ (160) Crooked Lake Marsh§ (186) Grand Mere§ (1,564) Hoffmaster Wild Area (246) Muskegon Dunes & Swales§ (330) Saugatuck Dunes Natural Area§ (291) Warren Dunes Nature Study Area§ (488) Warren Woods§ (312)	Grand Beach Marsh (11) Robinson Woods (80) Ross (1;423) Schwark Road Prairie (3.4)
212Hy			
222Jc		*no information*	*no information*
212Hl		Besser Natural Area§ (134) Duck-Mud Lake Chain Site§ (253) Lake Sixteen§ (133) Thompson's Harbor Natural Area (260) Wilderness St. Park§ (508) Wilderness St. Park Hardwood State Forest§ (5,161) Wilderness St. Park Natural Area§ (932)	Grass Bay (631) Squaw Bay (153)

§ We were unable to obtain community data for this area.

Huron-Manistee Table 7. Summary of subsection representation on the Huron-Manistee National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land. *?* = unknown

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Hu. Newago Outwash and Ice Contact	1	1	180	80	260 *<1%*
212Hv. Wellston Outwash and Ice Contact					0 *0%*
212Hq. Mio Outwash Plains		4		17,837	17,837 *1%*
212Hx. Hart Outwash and Lake Sands					0 *0%*
212Hr. Tawas Lake Plain					0 *0%*
212Hs. Cadillac End Moraines					0 *0%*
212Hp. Vanderbilt Moraines	1	3	388	2,210	2,598 *<1%*
212Hw. Manistee Outwash and Lake Sands	1	3	795	4,643	5,438 *1%*
212Hm. Harrisville Moraines		1		680	680 *<1%*
212Ht. Big Rapids Loamy Moraines					0 *0%*
222Ja. Southeast Lake Michigan Plains and Dunes		12		5,094	5,094 *1%*
212Hy. Kalkaska Moraines					0 *0%*
222Jc. Iona Moraines		*?*			*?*
212Hl. Cheboygon Lake Plain		9		8,165	8,165 *2%*
TOTAL	3	33	1,363	38,709	40,072 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *?* = unknown

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212Hu. Newago Outwash and Ice Contact	28	4 *14%*	1 *4%*	4 *14%*	
212Hv. Wellston Outwash and Ice Contact	33			0	
212Hq. Mio Outwash Plains	32		1 *3%*	1 *3%*	
212Hx. Hart Outwash and Lake Sands	27			0	
212Hr. Tawas Lake Plain	32			0	
212Hs. Cadillac End Moraines	25			0	
212Hp. Vanderbilt Moraines	21	2 *10%*		2 *10%*	
212Hw. Manistee Outwash and Lake Sands	35	4 *11%*	1 *3%*	5 *14%*	1
212Hm. Harrisville Moraines	10			0	
212Ht. Big Rapids Loamy Moraines	24			0	
222Ja. Southeast Lake Michigan Plains and Dunes	*?*			*?*	
212Hy. Kalkaska Moraines	8			0	
222Jc. Iona Moraines	1 *(+?)*			*?*	
212Hl. Cheboygon Lake Plain	4			0	1

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Huron-Manistee Table 8. Alliances of the Huron-Manistee National Forest arranged by community pattern and community distribution

COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	• Red Pine Forest • Jack Pine - (Red Pine) Wooded Herbaceous	• Northern White Cedar Complex • Jack Pine - Oak (Northern Pin, Black) Forest • Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland	• (Jack Pine, Red Pine) Woodland • Common Juniper Shrubland
LIMITED	• Eastern White Pine - Eastern Hemlock Forest • White Pine Forest • Eastern Hemlock - Yellow Birch Forest • White Pine - (Red Pine) - Quaking Aspen Forest	• Northern White Cedar Forest • Northern White Cedar Saturated Forest • Northern White Cedar - Red Maple Saturated Forest • Black Ash - Red Maple Saturated Forest • White Pine - (White Oak, Red Oak, Black Oak) Forest • American Beachgrass Herbaceous • White Pine - Oak (White, Red) Wooded Herbaceous • Herbaceous Dunes Sparse Vegetation	• Eastern Hemlock Saturated Forest • White Pine - (Red Maple) Saturated Forest • Shrubby Cinquefoil - Sweetgale - (Wire Sedge) Saturated Shrubland
WIDESPREAD	• Jack Pine Forest • White Spruce - Balsam Fir Forest • White Spruce - Balsam Fir - Aspen Forest • Black Oak - White Oak Forest • Sugar Maple - Yellow Birch - (American Beech) Forest • Quaking Aspen - Paper Birch Forest	• Black Spruce Saturated Forest • Tamarack Saturated Forest • Black Spruce - Tamarack Saturated Forest • Black Spruce Saturated Woodland • Speckled Alder Seasonally Flooded Shrubland • Leatherleaf Saturated Dwarf-Shrubland • Canada Bluejoint Seasonally Flooded Herbaceous • Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous • Tussock Sedge Seasonally Flooded Herbaceous • Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous	• Bog Birch - (Willow) Saturated Shrubland • Sedge spp. (*Carex rostrata, C. utriculata*) Seasonally Flooded Herbaceous • Wiregrass Sedge Saturated Herbaceous • Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous • Open Bluff/Cliff Sparse Vegetation • Sand Flats Temporarily Flooded Sparse Vegetation

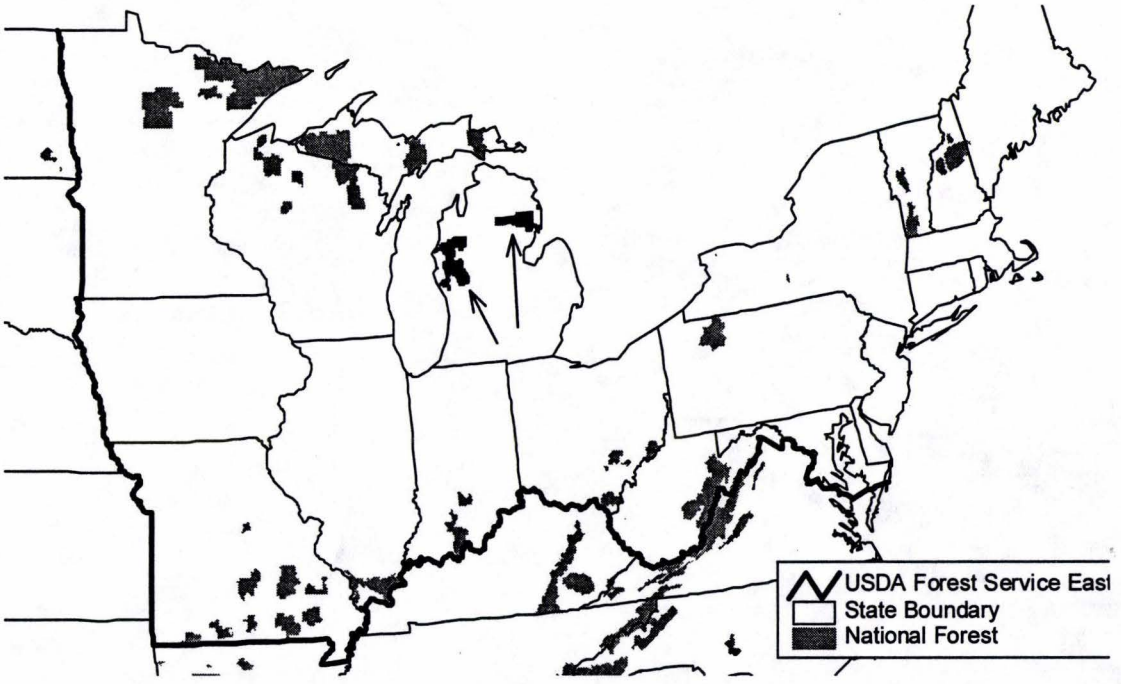
(cont.)

(Table 8 continued)

		• Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous • Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous	
PERIPHERAL	• White Oak - (Red Oak, Hickory) Forest • Little Bluestem - Indian Grass Herbaceous	• Red Oak - Sugar Maple - (White Oak) Forest • Sugar Maple - White Ash - American Basswood Forest • Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest • Silver Maple Temporarily Flooded Forest • White Oak - (Black Oak) Woodland • Buttonbush Semi-permanently Flooded Shrubland • Little Bluestem - (Sand Dropseed) Herbaceous • Prairie Cordgrass Temporarily Flooded Herbaceous	• Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous • Twig Rush Seasonally Flooded Herbaceous • Skunk Cabbage - Marsh Marigold Saturated Herbaceous • Northern Sea-rocket Sparsely Vegetated • Big Bluestem - (Indian Grass) Herbaceous

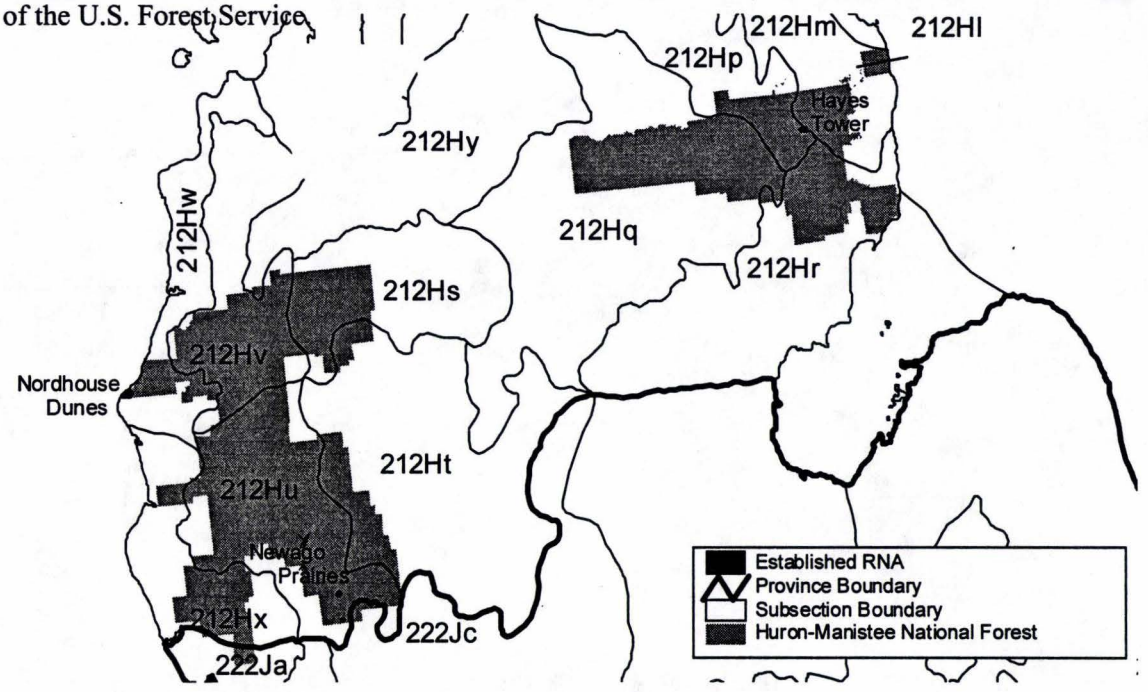
HURON-MANISTEE FIGURES

Huron-Manistee Figure 1. Location of the Huron-Manistee National Forest

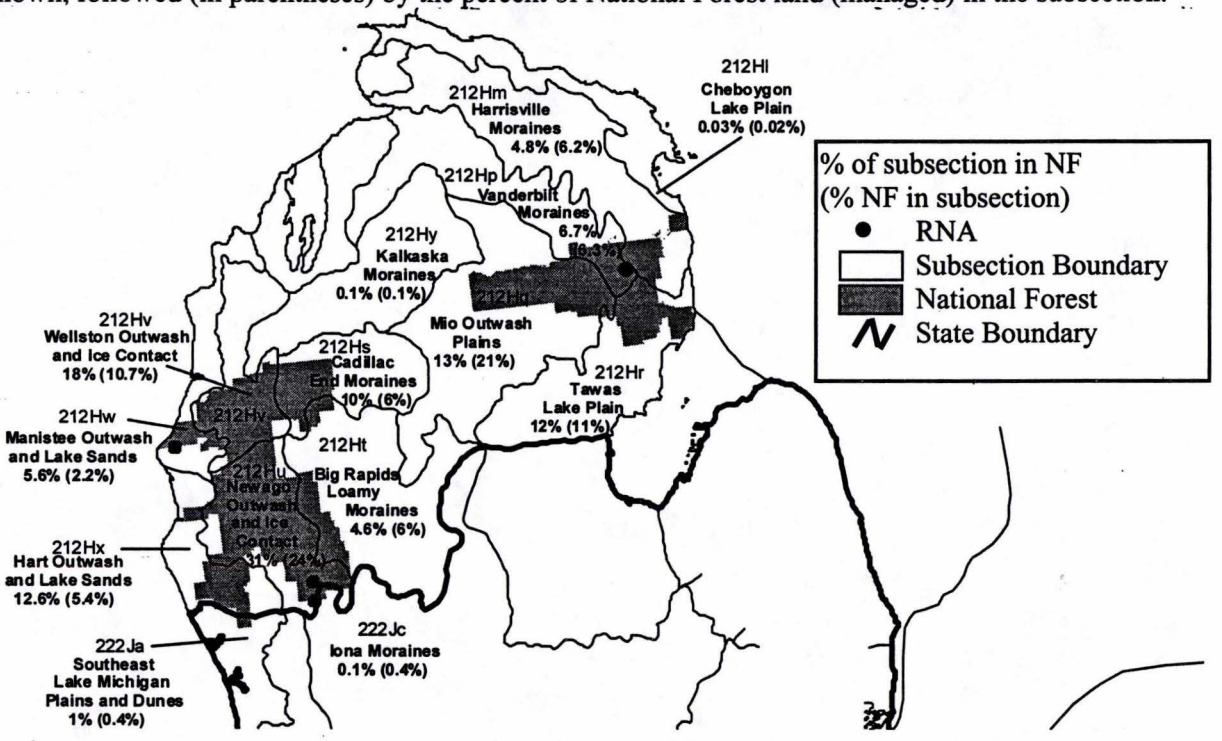


Huron-Manistee Figure 2. The Huron-Manistee National Forest with established RNAs and subsections

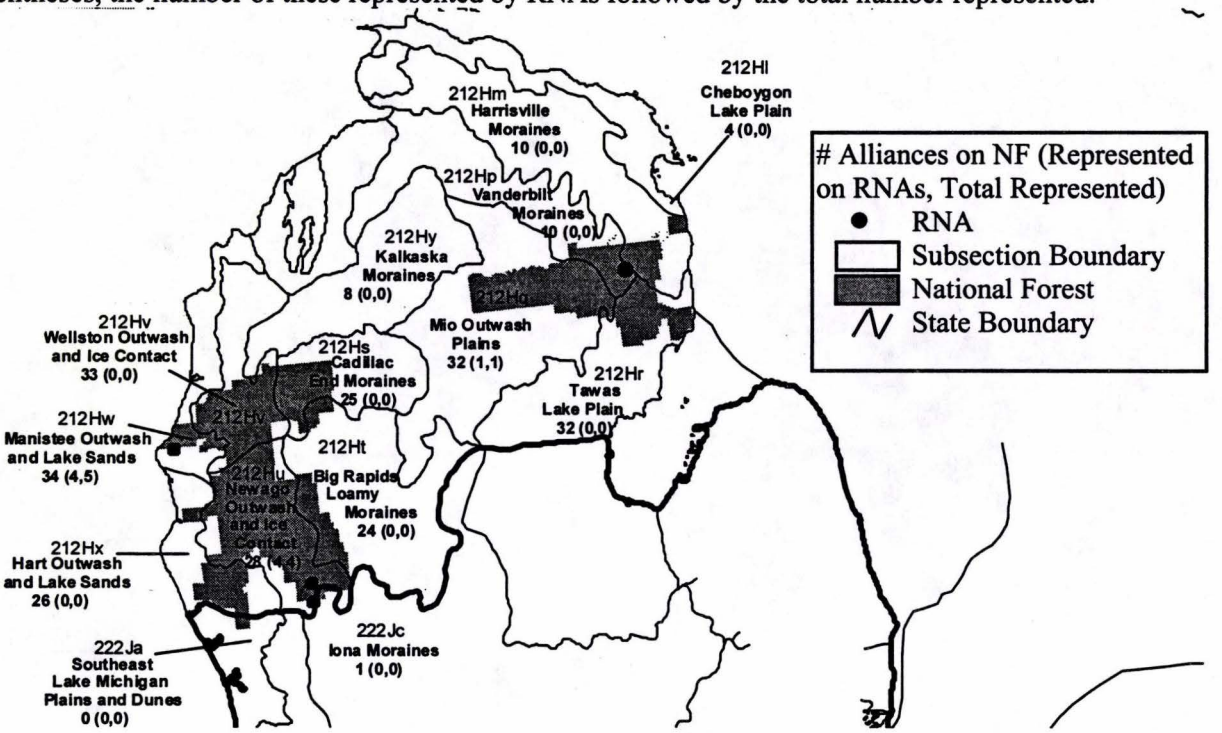
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Huron-Manistee Figure 3. Huron-Manistee National Forest in relation to subsections.
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percent of the subsection *managed* by the Huron-Manistee (*prominence)* is shown, followed (in parentheses) by the percent of National Forest land (managed) in the subsection.



Huron-Manistee Figure 4. Alliance representation on subsections of the Huron-Manistee.
The entire National Forest is shaded, though not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on National Forest land, and in parentheses, the number of these represented by RNAs followed by the total number represented.



Huron-Manistee Appendix A. Subsections of the Huron-Manistee National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Huron-Manistee Table 5 for information on the format of this table. The difference between these two tables is that Huron-Manistee Table 5 lists alliances reported on national forest land, and this Appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Huron-Manistee Table 5, i.e. to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances not Reported on NF Land**	212Hu (NOI)		212Hv (WOI)		212Hq (MOP)		212Hx (HOL)		212Hr (TLP)		212Hs (CEM)		212Hp (VM)		212Hw (MOL)		212Hm (HM)		212Ht (BRM)		222Ja (SLM)		212Hy (KM)		222Jc (IM)		212Hl (CLP)	
Matrix Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Eastern Hemlock Forest Alliance																												▪
American Beech - Sugar Maple - (Tuliptree) Forest Alliance																					▪				▪			
Black Oak - (Northern Pin Oak) Wooded Herbaceous Alliance																									▪			
Bur Oak - (White Oak) Wooded Herbaceous Alliance	▫																								▪			
Large Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Eastern Hemlock - Yellow Birch Forest Alliance																					▪							
Red Maple - Green Ash Seasonally Flooded Forest Alliance																					▫							
Big Bluestem - (Canada Bluejoint, Switchgrass) Herbaceous Alliance							▪																					
Little Bluestem - Indian Grass Herbaceous Alliance																					▪(1)							
Small Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Eastern Hemlock Forest Alliance																					▪							

--Subsections of Huron-Manistee NF--

Community Pattern **Alliances not Reported on NF Land**	212Hu (NOI)	212Hv (WOI)	212Hq (MOP)	212Hx (HOL)	212Hr (TLP)	212Hs (CEM)	212Hp (VM)	212Hw (MOL)	212Hm (HM)	212Ht (BRM)	222Ja (SLM)	212Hy (KM)	222Jc (IM)	212Hl (CLP)
Black Ash - Red Maple Saturated Forest Alliance													▪	
Northern White-cedar Woodland Alliance														▪
Buttonbush Semipermanently Flooded Shrubland Alliance													▪	
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	▪	▫		▫	▫	▫		▫	▫	▪	▫			▫
Highbush Blueberry Saturated Shrubland Alliance													▪	
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance													▪	
Leatherleaf Saturated Dwarf-Shrubland Alliance													▪	
Alkali Bulrush Semipermanently Flooded Herbaceous Alliance													▪	
Wild Rice Semipermanently Flooded Herbaceous Alliance			▪											
Shrubby Cinquefoil / Sedge Saturated Shrub Herbaceous Alliance													▪	
Open Pavement Sparse Vegetation														▪
Cobble/Gravel Shore Sparse Vegetation					▪									(1) ▪
Inland Strand Beach Sparse Vegetation			▪											
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation														▪

Huron-Manistee Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Huron-Manistee National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 212Hu. Newago Outwash and Ice Contact								
Matrix Alliances								
Little Bluestem - Indian Grass Herbaceous Alliance	Newago Prairies		65	B	AB	B	B	
Large Patch Alliances								
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	Newago Prairies		65	B	AB	B	B	
		Ore-Ida Prairie	63	B	AB	BC	B	
White Pine - Oak (White, Red) Wooded Herbaceous Alliance	Newago Prairies		42	C	AB	B	B	
Little Bluestem - (Sand Dropseed) Herbaceous Alliance	Newago Prairies		8	B	A	B	B	
		Ore-Ida Prairie	16	D	B	BC	C	
		Newago Outwash and Ice Contact (212Hu) Total.	259					
Subsection 212Hv. Wellston Outwash and Ice Contact								
		Wellston Outwash and Ice Contact (212Hv) Total.						
Subsection 212Hq. Mio Outwash Plains								
Matrix Alliances								
Red Pine Forest Alliance		Roscommon Red Pines	160	C	A	B	B	
		Mio Outwash Plains (212Hq) Total:	160					
Subsection 212Hr. Tawas Lake Plain								
		Tawas Lake Plain (212Hr) Total:						
Subsection 212Hs. Cadillac End Moraines								
		Cadillac End Moraines (212Hs) Total:						
Subsection 212Hp. Vanderbilt Moraines								
Matrix Alliances								
Quaking Aspen - Paper Birch Forest Alliance	Hayes T ?		110	C	CD	AB	QC	?
Large Patch Alliances								
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	Hayes T		150	B	AB	AB	AB	
Red Oak - Sugar Maple - (White Oak) Forest Alliance	Hayes T		130	C	B	AB	B	
		Vanderbilt Moraines (212Hp) Total:	390					

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Subsection 212Hw. Manistee Outwash and Lake Sands					
Matrix Alliances					
Jack Pine Forest Alliance	Nordhouse Dunes		80	C AB B	B
		Pt. Betsie	5	D AB BC	C
Black Oak - White Oak Forest Alliance	Nordhouse Dunes		127	C AB B	UM
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Nordhouse Dunes		120	C AB B	B
		Pt. Betsie	1	D AB BC	C
Jack Pine - (Red Pine) Wooded Herbaceous Alliance		Pt. Betsie	1	D AB BC	C
		Tower Troy	0	U AB BC	I
Large Patch Alliances					
Northern White Cedar Forest Alliance		Pt. Betsie	4	D AB BC	C
Red Oak - Sugar Maple - (White Oak) Forest Alliance		Pt. Betsie	2	D AB BC	BC
		Tower Troy	13	C AB BC	B
American Beachgrass Herbaceous Alliance	Nordhouse Dunes		456	B AB B	B
Herbaceous Dunes Sparse Vegetation	Nordhouse Dunes		0	U AB B	I
		Pt. Betsie	86	B AB BC	B
		Tower Troy	11	C AB BC	B
Small Patch Alliances					
Shrubby Cinquefoil - Sweetgale - (Wire Sedge) Saturated Shrubland Alliance	Nordhouse Dunes		12	B AB B	B
Twig Rush Seasonally Flooded Herbaceous Alliance	Nordhouse Dunes		0	U AB B	I
Northern Sea Rocket Sparsely Vegetated Alliance	Nordhouse Dunes		0	U AB B	I
		Manistee Outwash and Lake Sands (212Hw) Total.	918		
Subsection 212Hm. Harrisville Moraines					
		Harrisville Moraines (212Hm) Total:			
Subsection 212Ht. Big Rapids Loamy Moraines					
		Big Rapids Loamy Moraines (212Ht) Total:			
Subsection 222Ja. Southeast Lake Michigan Plains and Dunes					
Eastern White Pine - Eastern Hemlock Forest Alliance		Ross ?	620	B AB BC	QB ?
Matrix Alliances					
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Hoffmaster Wild Area	0	U B BC	U
		Robinson Woods	14	U AB BC	U
Black Oak - White Oak Forest Alliance		Grand Beach Marsh ?	4	D AB BC	QUM ?
White Oak - (Red Oak, Hickory species) Forest Alliance		Robinson Woods	31	C AB BC	B
Large Patch Alliances					

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Red Oak - Sugar Maple - (White Oak) Forest Alliance		Ross	319	B AB BC	B
Red Maple - Green Ash Seasonally Flooded Forest Alliance		Robinson Woods ?	20	B AB BC	QB ?
		Ross ?	4	C AB BC	QB ?
Little Bluestem - Indian Grass Herbaceous Alliance		Schwark Road Prairie	3	D AB BC	C
American Beachgrass Herbaceous Alliance		Hoffmaster Wild Area	0	U B BC	U
Tussock Sedge Seasonally Flooded Herbaceous Alliance		Ross	61	B AB BC	B
Small Patch Alliances					
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Ross ?	311	A AB BC	QAB ?
Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous Alliance		Grand Beach Marsh	7	B AB BC	B
		Ross	11	B AB BC	B
		Southeast Lake Michigan Plains and Dunes (222Ja) Total.	1,405		

Subsection 212Hy. *Kalkaska Moraines*

		Kalkaska Moraines (212Hy) Total:			

Subsection 222Jc. *Iona Moraines*

		Iona Moraines (222Jc) Total:			

Subsection 212Hl. *Cheboygon Lake Plain*

Large Patch Alliances					
Northern White Cedar Saturated Forest Alliance		Grass Bay	188	B C BC	BC
		Squaw Bay	67	B AB BC	B
American Beachgrass Herbaceous Alliance		Grass Bay	36	C BC BC	BC
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Squaw Bay	6	C AB BC	BC
Northern White Cedar Complex		Grass Bay	374	B AB BC	B
		Squaw Bay	40	C AB BC	B
Small Patch Alliances					
Twig Rush Seasonally Flooded Herbaceous Alliance		Grass Bay	23	C B BC	BC
Wiregrass Sedge Saturated Herbaceous Alliance		Grass Bay	5	B B BC	B
		Squaw Bay	40	B AB BC	B
		Thompson's Harbor Natural Area	160	A A BC	AB
Cobble/Gravel Shore Sparse Vegetation		Thompson's Harbor Natural Area	60	A A BC	AB
		Cheboygon Lake Plain (212Hl) Total:	999		
		Grand Total:	4,131		

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Huron-Manistee Appendix C. Unrepresented alliances (Forest-wide) on the Huron-Manistee National Forest

The following alliances are not represented in any of the subsections in which they occur on Huron-Manistee land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

Matrix Alliances:

- Jack Pine - (Red Pine) Wooded Herbaceous Alliance (endemic)
- Eastern Hemlock - Yellow Birch Forest Alliance (limited)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance (limited)
- Eastern White Pine - Eastern Hemlock Forest Alliance (limited)
- White Pine Forest Alliance (limited)
- White Spruce - Balsam Fir - Aspen Forest Alliance (widespread)
- White Spruce - Balsam Fir Forest Alliance (widespread)
- Black Oak - White Oak Forest Alliance (widespread)
- Quaking Aspen - Paper Birch Forest Alliance (widespread)
- White Oak - (Red Oak, Hickory species) Forest (peripheral)

Large-Patch Alliances:

- Jack Pine - Oak (Northern Pin, Black) Forest Alliance (endemic)
- Northern White Cedar Complex (endemic)
- Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance (endemic)
- Northern White Cedar Forest Alliance (limited)
- Northern White Cedar Saturated Forest Alliance (limited)
- Northern White Cedar - Red Maple Saturated Forest Alliance (limited)
- Black Ash - Red Maple Saturated Forest Alliance (limited)
- Black Spruce - Tamarack Saturated Forest Alliance (widespread)
- Black Spruce Saturated Forest Alliance (widespread)
- Tamarack Saturated Forest Alliance (widespread)
- Black Spruce Saturated Woodland Alliance (widespread)
- Speckled Alder Seasonally Flooded Shrubland Alliance (widespread)
- Leatherleaf Saturated Dwarf-Shrubland Alliance (widespread)
- Canada Bluejoint Seasonally Flooded Herbaceous Alliance (widespread)
- Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance (widespread)
- Tussock Sedge Seasonally Flooded Herbaceous Alliance (widespread)
- Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance (widespread)
- Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance (widespread)
- Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance (widespread)
- Sugar Maple - White Ash - American Basswood Forest Alliance (peripheral)
- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (peripheral)
- Silver Maple Temporarily Flooded Forest Alliance (peripheral)
- White Oak - (Black Oak) Saturated Woodland Alliance (peripheral)
- Buttonbush Semipermanently Flooded Shrubland Alliance (peripheral)
- Prairie Cordgrass Temporarily Flooded Herbaceous Alliance (peripheral)

Small Patch Alliances:

- (Jack Pine - Red Pine) Woodland Alliance (endemic)
- Common Juniper Shrubland Alliance (endemic)
- Eastern Hemlock Saturated Forest Alliance (limited)
- White Pine - (Red Maple) Saturated Forest Alliance (limited)
- Bog Birch - (Willow) Saturated Shrubland Alliance (widespread)
- Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance (widespread)
- Wiregrass Sedge Saturated Herbaceous Alliance (widespread)
- Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance (widespread)
- Open Bluff/Cliff Sparse Vegetation Alliance (widespread)
- Sand Flats Temporarily Flooded Sparse Vegetation Alliance (widespread)
- Big Bluestem - (Indian Grass) Herbaceous Alliance (peripheral)
- Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous Alliance (peripheral)
- Twig Rush Seasonally Flooded Herbaceous Alliance (peripheral)
- Skunk Cabbage - Marsh Marigold Saturated Herbaceous Alliance (peripheral)
- Northern Sea Rocket Sparse Vegetation Alliance (peripheral)

Huron-Manistee Appendix D. Potential RNA-equivalents from the Michigan Natural Heritage Database and the Huron-Manistee Representative RNA Pilot Study (1994)

- **These areas have not been evaluated for RNA-equivalency.**
- An entire area or a definable portion of an area may be determined to be an RNA-equivalent.

Areas containing Element Occurrences (EOs) in the Michigan Natural Heritage Database
The list of subsections comes from an digital overlay of the centrum point of each EO with the subsection map of Keys *et al.* (1995). They do not necessarily correctly identify the subsection(s) in which the managed area occurs.

Agency	Name	Subsection(s)
USFS (Manistee)	Nordhouse Dunes Wilderness Area	212Hw
	Newago Prairies Ecological Study Area	212Hu
	Pere Marquette National Scenic River	212Hu
National Park Service	Sleeping Bear Dunes National Lakeshore	212Hw, 212Oa
Great Lakes Program	Duncan Bay Environmental Area	212Hl
	Squaw Bay Environmental Area	212Hl
	Whitefish Bay Environmental Area	212Hl
	Wilderness Environmental Area	212Hl
Michigan Forest Management	Sand Lakes Quiet Area	212Hy
University of Michigan	Colonial Point Forest Preserve	212Hm
Michigan Nature Association	Five Lakes Muskegon Plant Preserve	222Ja
	Newago Prairies Plant Preserve	212Hu
Little Traverse Conservancy	Orchis Fen (Kruzel's Bog)	212Hm
Cranbrook Institute	South Island Environmental Study Area	212Hv

Huron-Manistee National Forest Wilderness & Special Areas
Identified in the Huron-Manistee pilot as potential RNA-equivalents.

Name	Subsection
White Candidate Wild & Scenic River	212Hu
Little Manistee Proposed Wild & Scenic River	212Hv
Manistee Wild & Scenic River	212Hv
Pine River Corridor	212Hv

IX. H. Mark Twain National Forest RNA Assessment

MARK TWAIN SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Mark Twain National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Mark Twain National Forest lands. The Mark Twain National Forest occupies portions of 12 subsections. Based on data from the 7 dominant subsections, at least 19 alliances occur on Mark Twain lands, with the number of alliances in each subsection ranging from 2 to 13. In these 7 subsections there are 51 alliance-subsection combinations; these are the ecosystems to represent for the Mark Twain National Forest. The number of alliances identified in each of these subsections is still incomplete, and data still need to be compiled for the 5 minor subsections.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

There are currently no established RNAs on the Mark Twain National Forest.

Existing **RNA-equivalents** in the 12 subsections include:

- 7 USDA Forest Service Wilderness Areas,
- 78 Missouri Designated Natural Areas, and
- 18 preserves of The Nature Conservancy.

These 103 RNA-equivalents currently represent 27 (53%) of the Mark Twain alliance-subsection combinations (ecosystems). The number of represented ecosystems is probably larger because community data were unavailable for the Wilderness Areas. Identifying alliances in these areas could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTED ECOSYSTEMS

The Mark Twain has 24 ecosystems that are unrepresented by RNAs or RNA-equivalents, based on data from 7 subsections. Methods for filling gaps in representation include:

- confirming ecosystems to represent in the 7 major subsections
- determining ecosystems to represent in the 5 minor subsections
- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Mark Twain are:

- Gasconade River Hills (222Ad)
- Black River Ozark Border (222Al)
- White River Hills (222Ag)
- Meramec River Hills (222Ae), and
- Current River Hills (222Af).

The Mark Twain has high prominence (> 10%) in these subsections, and more than 30% of their alliances are unrepresented in each.

The **medium-priority subsection** is the Central Plateau (222Ab). Mark Twain prominence in this subsection is 3%, and 60% of the alliances are unrepresented.

Low-priority subsections are St. Francis Knobs and Basins (222Aa), Outer Ozark Border (222Ak), Inner Ozark Border (222Aj), Claypan Till Plain (251Cd), Springfield Plain (222Am), and White and Black Rivers Alluvial Plain (234Ac). Subsection 222Aa is low priority because all of its known alliances are represented. In all the remaining subsections the Mark Twain has less than 2% prominence.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there is one **high-priority alliance** on the Mark Twain: White Oak - (Red Oak, Hickory species) Forest Alliance. This alliance is not currently represented in 3 of the 5 subsections where it is known to occur. If more matrix alliances are found on the Mark Twain, they would also be high priority.

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IX.H.1. INTRODUCTION

The Mark Twain National Forest is located in southern Missouri (Mark Twain Figure 1). Its proclamation boundaries and purchase unit boundaries contain 3,060,124 acres, with 1,494,217 acres (49%) of this land currently (FY97) managed by the Mark Twain.

The Mark Twain National Forest occurs primarily in Province 222 (Eastern Broadleaf Forest (Continental) Province) and has small portions in Provinces 251 and 234. Appendix VIII lists the other national forests in these provinces. The Mark Twain National Forest can work with the other national forests in each province to evaluate province-wide representation and establish priorities for the province.

IX.H.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Mark Twain.

IX.H.2.a. Subsections

We identified the subsections occurring on the Mark Twain National Forest using an overlay of a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo) on the digital subsection map of Keys *et al.* (1995, 1:3,500,000 scale).

We used these digital maps to determine the amount of land in each subsection within Mark Twain proclamation boundaries and purchase units. To estimate ownership acreage within each subsection, we multiplied these values by 49%, the fraction of ownership to proclamation acres for the entire Mark Twain National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with national forest land (ownership).

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percent of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.H.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Missouri, we first compiled the natural community occurrences recorded in Natural Heritage Databases. The Natural Heritage names for the occurrences had already been translated to associations (one classification level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because only a subset of community occurrences are documented in the Heritage database, we sent the community lists to state Heritage/Department of Conservation (Mike Leahy, Tim Nigh) and national forest ecologists (Lynda Richards), who added additional associations and alliances that occur in each subsection with national forest land, and those that occur on national forest land in the subsection. Tim Nigh reviewed alliances in each subsection and those on national forest land. The alliances that occur on Forest Service lands are the focus of the RNA assessment.

Several subsections have no information about alliances on national forest land. The subsections 222Ak, 222Aj*, 251Cd, 222Am*, and 234Ac contain such small amounts of national forest land that the ecologists were unable to list alliances with any confidence. (*The starred subsections were not reviewed.)

IX.H.2.c. Identifying RNA-equivalents

No RNAs have been established on the Mark Twain NF. RNA-equivalents were identified in discussions of ecologists of the USDA Forest Service, the Missouri Department of Conservation (including the Natural Heritage Database) and the authors. Karen Kramer compiled the data on State Natural Areas and Blane Heumann compiled the information on TNC preserves. The RNA Committee of the Mark Twain National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.H.2.d. Digitizing RNAs

Readers can request from the Regional RNA Coordinator a region-wide RNA cover at regional projections.

IX.H.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

Our sources for community occurrences on Missouri Designated Natural Areas and TNC Preserves were Element Occurrence data from the Missouri Natural Heritage Database and the expertise of staff of the Missouri Department of Conservation. Total acreage for each SNA or Preserve also came from the Missouri Natural Heritage Database. TNC Preserve information was reviewed by Blane Heumann. Questions remain on several of the Designated Natural Areas (Mark Twain Appendix B).

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Mark Twain Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Mark Twain National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.H.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Mark Twain National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.H.3.a. Subsections on national forest land

The 12 subsections that occur on Mark Twain National Forest land are listed below (Mark Twain Figure 2). These subsections are listed in order of *prominence*, the percent of the subsection on national forest land (Mark Twain Table 4).

- Current River Hills (222Af)
- Black River Ozark Border (222Al)
- Gasconade River Hills (222Ad)
- Meramec River Hills (222Ae)
- White River Hills (222Ag)

- St. Francis Knobs and Basins (222Aa)
- Central Plateau (222Ab)
- Outer Ozark Border (222Ak)
- Inner Ozark Border (222Aj)
- Claypan Till Plain (251Cd)
- Springfield Plain (222Am)
- White and Black Rivers Alluvial Plain (234Ac)

The Mark Twain National Forest is divided relatively evenly among the first 7 of these 12 subsections (Mark Twain Table 4, Mark Twain Figure 3). They range from 8 to 22% of the National Forest: White River Hills (222Ag, 22% of national forest land), Current River Hills (222Af, 17%), Central Plateau (222Ab, 15%), Gasconade River Hills (222Ad, 12%), Meramec River Hills (222Ac, 11%), Black River Ozark Border (222Al, 10%), and St. Francis Knobs and Basins (222Aa, 8%). In addition, over 10% of each of these subsections, except 222Ab, are managed by the Mark Twain. Three percent of Subsection 222Ab is managed by the National Forest.

The remaining 4% of the National Forest is in 5 subsections, each portion less than 2% of the total National Forest acreage. Also, less than 2% of each of these subsections is managed by the National Forest. These subsections are Outer Ozark Border (222Ak), Inner Ozark Border (222Aj), Claypan Till Plain (251Cd), Springfield Plain (222Am), and White and Black Rivers Alluvial Plain (234Ac).

The Mark Twain shares 2 subsections with the Ozark National Forest in Arkansas: 222Ab and 222Ag. The Ozark National Forest is not included in our Regional Assessment because it is in the Southern rather than the Eastern Region of the USDA Forest Service, and this Assessment was developed for the Eastern Region. However, this does not mean that alliances found on Ozark National Forest land in subsections 222Ab and 222Ag cannot represent ecosystems for the Mark Twain National Forest. On the contrary, where RNAs or RNA-equivalents protect alliances in the Arkansas portion of these subsections, they could fill representation needs. It is hoped that in the future this information could be compiled.

IX.H.3.b. Natural communities within subsections

A total of 59 alliances are reported to occur in these 12 subsections, although we expect that the actual number of alliances is probably higher. Alliances on national forest land have been identified in the 7 dominant subsections but not in the 5 minor subsections (see Methods). In the 7 dominant subsections, 19 alliances have been identified to occur on national forest land (Mark Twain Table 5, first column); we also expect this number to be higher and encourage review this list. The 40 alliances reported for any of the 12 subsections but not reported to occur on national forest land are listed in Mark Twain Appendix A.

Of the 19 alliances identified on national forest land, one is a **matrix** alliance (see Mark Twain Table 5, first set of alliances), 10 are **large patch** (second set) and 8 are **small patch** (third set) (See "National Vegetation Classification," pp. 8-9).

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on Mark Twain land in each subsection:

- Current River Hills (222Af): 13 alliances (6 large patch, 7 small patch)
- Black River Ozark Border (222Al): 5 alliances (2 large patch, 3 small patch)
- Gasconade River Hills (222Ad): 8 alliances (1 matrix, 2 large patch, 5 small patch)
- Meramec River Hills (222Ae): 3 alliances (1 matrix, 2 small patch)
- White River Hills (222Ag): 9 alliances (1 matrix, 3 large patch, 5 small patch)
- St. Francis Knobs and Basins (222Aa): 2 alliances (1 matrix, 1 small patch)
- Central Plateau (222Ab): 10 alliances (1 matrix, 4 large patch, 5 small patch)

- Outer Ozark Border (222Ak): *none reported*
- Inner Ozark Border (222Aj): 1 alliances (1 large patch)
- Claypan Till Plain (251Cd): *none reported*
- Springfield Plain (222Am): *none reported*
- White & Black Rivers All. Plain (234Ac): *none reported*

There are a total of 51 subsection-alliance combinations identified on Mark Twain land. Mark Twain Table 5 shows the alliances that occur in each subsection.

IX.H.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs only in RNA-equivalents, because the Mark Twain National Forest currently has no established RNAs (Mark Twain Table 1, Mark Twain Table 6). The Forest does have 6 candidate RNAs (cRNAs), but these are not part of the assessment because they do not yet have Level I protection status.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNA-equivalents in each subsection are shown in the appropriate cells of Mark Twain Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Mark Twain Appendix B for a complete list of alliances occurring on individual RNA-equivalents.

RNA-equivalents

USDA Forest Service and Missouri Department of Conservation personnel have agreed that the following areas are RNA-equivalents (Mark Twain Table 2):

- all USDA Forest Service and US Fish and Wildlife Service Wilderness Areas,
- all Missouri Designated Natural Areas, and
- all of The Nature Conservancy's (TNC's) preserves[10].

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Mark Twain Table 3). Mark Twain personnel can work with conservation partners to find additional RNA-equivalents. At present, USDA Forest Service Sensitive (6.1) Areas are not considered RNA-equivalents.

Seven Mark Twain National Forest Wilderness Areas, 78 Missouri Designated Natural Areas, and 18 preserves of The Nature Conservancy serve as RNA-equivalents for the Mark Twain National Forest (Mark Twain Table 6, 7a). We were unable to obtain community data for the Wilderness Areas, so there is likely to be a higher number of represented ecosystems than indicated below.

Current River Hills (Subsection 222Af)

Subsection 222Af contains one Forest Service Wilderness Area (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Irish Wilderness–west third,

21 Missouri Designated Natural Areas, together covering 8,696 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Big Barren Creek (232)

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[10] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

- Big Springs Pines (345)
- Blair Creek Raised Fen (3)
- Brushy Pond (28)
- Bur Oak Basin (230)
- Gilmore Pond (10)
- Grasshopper Hollow (593)
- Grassy Pond (1)
- Husman Fen (1)
- Jacks Fork (966)
- Lily Pond (8)
- Mill Mountain (180)
- Montauk Upland Forest (40)
- Mule Hollow Glade (44)
- Pioneer (20)
- Prairie Hollow Gorge (74)
- Red Maple Pond (84)
- Stegall Mountain (5,387)
- Sunklands (160)
- Tunnel Bluff Woods (288)
- Wells Branch Fen (2)

and 7 TNC preserves (Mark Twain Tables 6, 7a):

- Alton Box–Bat Cave
- Alton Box–Pulltite
- Chilton Creek
- Grasshopper Hollow
- Lily Pond
- Shut-In Mountain Fens
- Thorny Mountain

The 8,466 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the one USDA Forest Service Wilderness Area and for the 7 TNC preserves. Thus at least 0.6% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 13 alliances reported to be on national forest land in Subsection 222Af, 9 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Af; Mark Twain Table 7b; Mark Twain Figure 4).

Of 6 **large patch** alliances, 3 are represented, and of the 7 **small patch** alliances, 6 are represented.

One of the 3 unrepresented **large patch** alliances and the only unrepresented **small patch** alliance have low-quality occurrences on RNA-equivalents:

- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (large patch—Tunnel Bluff Woods Designated Natural Area)
- Black Ash - Red Maple Saturated Forest Alliance (small patch—Grasshopper Hollow Designated Natural Area)

Black River Ozark Border (Subsection 222Al)

Subsection 222Al contains 3 Missouri Designated Natural Areas, together covering 1,133 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Blue Pond (15)
- Mud Creek (1,038)
- Poplar Bluff Forest (80)

Thus, 1,133 acres (0.1%) of the subsection is protected by RNA-equivalents (Mark Twain Table 7a).

Natural Communities (Alliances)

Of 5 alliances reported to be on national forest land in Subsection 222Al, 2 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Al; Mark Twain Table 7b; Mark Twain Figure 4).

Both of the 2 **large patch** alliances are represented, and none of the 3 **small patch** alliances are represented.

Gasconade River Hills (Subsection 222Ad)

Subsection 222Adj contains one USDA Forest Service Wilderness Area (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Paddy Creek–east third, and

4 Missouri Designated Natural Areas, together covering 604 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Clifty Creek (230)
- Eck Memorial (265)
- Horseshoe Bend (69)
- Spring Creek Gap Glades (40)

The 604 acres of RNA-equivalent land area shown in Mark Twain Table 7a is an underestimate of the total, because acreage for the one Forest Service Wilderness Area was unavailable. Thus at least 0.05% of the subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 8 alliances reported to be on national forest land in Subsection 222Ad, 3 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Ad; Mark Twain Table 7b; Mark Twain Figure 4).

The only **matrix** alliance to occur in Subsection 222Ad is represented. In addition, of the 2 **large patch** alliances, one is represented, and of the 5 **small patch** alliances, 2 are represented.

Meramec River Hills (Subsection 222Ae)

Subsection 222Ae contains 4 Missouri Designated Natural Areas, together covering 593 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Coonville Creek (49)
- Meramec Upland Forest (461)
- Spring's End Forest (15)
- Washington State Park Hardwoods (68),

and one TNC preserve (Mark Twain Tables 6, 7a):

- Zahorsky Woods

The 593 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the one TNC preserve. Thus at least 0.05% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 3 alliances reported to be on national forest land in Subsection 222Ae, 2 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Ae; Mark Twain Table 7b; Mark Twain Figure 4).

The only **matrix** alliance has 2 low-quality occurrences on RNA-equivalents:

- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix; Meramec Upland Forest Designated Natural Area, Zahorsky Woods)

Both **small patch** alliances occurring in Subsection 222Ae are represented.

White River Hills (Subsection 222Ag)

Subsection 222Ag contains 3 Forest Service Wilderness Areas (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Devil's Backbone
- Hercules Glade
- Piney Creek,

8 Missouri Designated Natural Areas, together covering 5,098 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Ashe Juniper (31)
- Butler Hollow Glade (385)
- Caney Mountain (1,330
- Carmen Springs (2,810)
- Haden Bald (40)
- Roaring River Cove Hardwoods (120)
- Rock Spring Bluff (20)
- White River Balds (362),

and 2 TNC preserves (Mark Twain Tables 6, 7a):

- Alma Peterson Azalea Memorial
- NL Williams Woods.

The 5,098 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the 3 USDA Forest Service Wilderness Areas and for the 2 TNC preserves. Thus at least 0.2% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 9 alliances reported to be on national forest land in Subsection 222Ag, 5 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Ag; Mark Twain Table 7b; Mark Twain Figure 4).

The only **matrix** alliance is represented; of 3 **large patch** alliances, 1 is represented, and of 5 **small patch** alliances, 3 are represented.

One of two unrepresented **large patch** alliances has a low-quality occurrence on RNA-equivalent land due to small size:

- Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance (large patch—Carmen Springs Designated Natural Area)

St. Francis Knobs and Basins (Subsection 222Aa)

Subsection 222Aa contains 2 Forest Service Wilderness Areas (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Bell Mountain
- Rock Pile Mountain,

11 Missouri Designated Natural Areas, together covering 10,641 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Buck Mountain (120)
- Castor River Shut-ins (209)
- Hickory Canyons (981)
- Hughes Mountain (392)
- Johnson's Shut-ins Dolomite Glade (18)
- Mudlick Mountain (1,370)
- Orchid Valley (120)
- Pickle Creek (58)
- Pickle Springs (257)
- Royal Gorge (80)
- St. Francois Mountains (7,028)

and one TNC preserve (Mark Twain Tables 6, 7a):

- Silas Dees Azalea

The 10,641 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the 2 USDA Forest Service Wilderness Areas and for the one TNC preserve. Thus at least 0.96% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 2 alliances reported to be on national forest land in Subsection 222Ag, both are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Ag; Mark Twain Table 7b; Mark Twain Figure 4).

The only **matrix** and **small patch** alliances found in Subsection 222Ag are represented.

Central Plateau (Subsection 222Ab)

Subsection 222Ab contains 2 USDA Forest Service Wilderness Areas (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Irish Wilderness–east third
- Paddy Creek–west third,

10 Missouri Designated Natural Areas, together covering 785 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Bald Hill Glade (332)
- Cowards Hollow SNA (56)
- Cupola Pond (160)[11]
- Haney Pond (68)
- La Petite Gemme Prairie (37)
- Marg Pond (42)
- Mint Spring Seep (5)
- Overcup Oak (5)
- Quercus Flatwoods (48)
- Tupelo Gum Pond (32)

and one TNC preserve (Mark Twain Tables 6, 7a):

- Hyer Woods

The 785 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the 2 Wilderness Areas and for the one TNC preserve. Thus at least 0.01% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Of 10 alliances reported to be on national forest land in Subsection 222Ab, 4 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Mark Twain Table 5, column 222Af; Mark Twain Table 7b; Mark Twain Figure 4).

The one **matrix** alliance is not represented. Of the 4 **large patch** alliances, 2 are represented, and of the 5 **small patch** alliances, 2 are represented.

One of 2 unrepresented **large patch** alliances has 2 low-quality occurrences on RNA-equivalent land:

- Post Oak Flatwoods Forest Alliance (large patch—Overcup Oak Sink Designated Natural Area, Quercus Flatwoods Designated Natural Area)

Outer Ozark Border (Subsection 222Ak)

Subsection 222Ak contains 4 Missouri Designated Natural Areas, together covering 547 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Babler Southwoods Hollow (17)
- Engelmann Woods (148)
- Graham Cave Glades (82)
- Vancil Hollow (300)

and one TNC preserve (Mark Twain Tables 6, 7a):

- Hinkson Valley

[11] Also a candidate RNA.

The 547 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the one TNC preserve. Thus at least 0.03% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

No alliances have been identified on the estimated 29,727 acres of Mark Twain land in this subsection (see Methods). Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

Inner Ozark Border (Subsection 222Aj)

Subsection 222Aj contains 3 Missouri Designated Natural Areas, together covering 336 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Botkins Pine Woods (30)
- Lamotte Sandstone Barrens (81)
- Valley View Glades (225)

and one TNC preserve (Mark Twain Tables 6, 7a):

- Victoria Glade

The 336 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the one TNC preserve. Thus at least 0.02% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

Only one alliance has been identified on the estimated 17,191 acres of Mark Twain land in this subsection (see Methods; Mark Twain Table 5, column 222Aj; and Mark Twain Table 7b, Mark Twain Figure 4); community data came only from Element Occurrences in the Missouri Natural Heritage database. This alliance (Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance) has low-quality occurrences on 2 Natural Areas, and therefore is not represented in this subsection. Other ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

Claypan Till Plain (Subsection 251Cd)

Subsection 251Cd contains one Missouri Designated Natural Area covering 48 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Danville Glades

Thus, 48 acres (0.002%) of this subsection are protected by an RNA-equivalent (Mark Twain Table 7a).

Natural Communities (Alliances)

No alliances have been identified on the estimated 5,955 acres of Mark Twain land in this subsection (see Methods). Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

Springfield Plain (Subsection 222Am)

Subsection 222Am contains 4 Missouri Designated Natural Areas, together covering 704 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Bona Glade (20)
- Diamond Grove Prairie (611)
- Mount Vernon Prairie (41)
- Wildcat Glade (32)

and 4 TNC preserves (Mark Twain Tables 6, 7a):

- Corry Flatrocks
- Greenfield Glade
- Mount Vernon Prairie
- Rocky Barrens

The 704 acres of RNA-equivalent land shown in Mark Twain Table 7a is an underestimate, because acreage information was unavailable for the 4 TNC preserves. Thus, at least 0.02% of this subsection is protected by RNA-equivalents.

Natural Communities (Alliances)

No alliances have been identified on the estimated 3,330 acres of Mark Twain land in this subsection because community data came only from Element Occurrences in the Missouri Natural Heritage database. Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

White & Black Rivers Alluvial Plain (Subsection 234Ac)

Subsection 234Ac contains 4 Missouri Designated Natural Areas, together covering 303 acres (Mark Twain Figure 3, Mark Twain Tables 6, 7a):

- Allred Lake (76)
- Bradyville (139)
- Otter Slough (20)
- Sand Ponds (68)

Thus, 303 acres (0.01%) of this subsection are protected by RNA-equivalents (Mark Twain Table 7a).

Natural Communities (Alliances)

No alliances have been identified on the estimated 2,131 acres of Mark Twain land in this subsection (see Methods). Ecosystems to represent cannot be identified until the existing alliances on national forest land are known.

IX.H.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Mark Twain National Forest (MT NF). The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Mark Twain Table 5 by shaded cells which contain no number. Alliances that are not represented in any Mark Twain subsection (unrepresented Forest-wide) are listed in Mark Twain Appendix C.

Subsection	Dominance Percentage of MT NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on MT NF land	Percentage of NF alliances represented	Proposed priority
222Ad. Gasconade River Hills	12	0.05	15.7	38	high
222Al. Black River Ozark Border	10	0.1	16	40	high
222Ag. White River Hills	22	0.2	11	56	high
222Ae. Meramec River Hills	11	0.05	14.5	67	high
222Af. Current River Hills	17	0.6	17	69	high
222Ab. Central Plateau	15	0.01	3	40	medium
222Aa. St. Francis Knobs and Basins	8	0.96	10.6	100	low
222Ak. Outer Ozark Border	2	0.03	1.4	*unknown*	low
222Aj. Inner Ozark Border	1	0.02	0.9	*unknown*	low
251Cd. Claypan Till Plain	0.4	0.002	0.2	*unknown*	low
222Am. Springfield Plain	0.2	0.02	0.1	*unknown*	low
234Ac. White and Black Rivers Alluvial Plain	0.1	0.01	0.08	*unknown*	low

The following 5 subsections are high priority to represent because they have greater than 10% prominence and fewer than 70% of their alliances are represented: Gasconade River Hills (222Ad), Black River Ozark Border (222Al), White River Hills (222Ag), Meramec River Hills (222Ae), and Current River Hills (222Af). The Central Plateau (222Ab) is medium priority with a prominence of 3% prominence and 40% of its alliances are represented. The other dominant subsection, St. Francis Knobs and Basins (222Aa), is low priority because all of its known alliances are already represented. Its priority could change if more alliances are identified on national forest land in the subsection.

The remaining 5 alliances are what we have called the "minor" alliances. All have a prominence of <2% and are low priority. These subsections are lacking alliance data, however, and obtaining this data may be important. In particular, they should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

If more alliances are identified on national forest land in some of these subsections, the order of priority could change.

Gasconade River Hills (Subsection 222Ad)

Of 8 alliances, 3 are represented, leaving 5 alliances (63%) in need of representation (Mark Twain Figure 4). The unrepresented matrix type may be the highest priority for RNA establishment:

- White Oak - (Red Oak, Hickory species) Forest Alliance.

Other matrix alliances, if identified, would also be high priority.

Black River Ozark Border (Subsection 222Al)

Of 5 alliances, 2 are represented, leaving 3 (60%) in need of representation (Mark Twain Figure 4).

White River Hills (Subsection 222Ag)

Of 9 alliances, 5 are represented, leaving 4 (44%) in need of representation (Mark Twain Figure 4).

Meramec River Hills (Subsection 222Ae)

Two of the 3 alliances are represented, leaving 1 alliance (33%) in need of representation (Mark Twain Figure 4). The unrepresented matrix type may be the highest priority for RNA establishment (and other matrix alliances may yet be identified):

- White Oak - (Red Oak, Hickory species) Forest Alliance.

This alliance has low-quality occurrences on 2 RNA-equivalents (Mark Twain Table 7b, Mark Twain Appendix B). The quality/viability of these occurrences should be verified.

Current River Hills (Subsection 222Af)

Of 13 alliances, 9 are represented, leaving 4 alliances (31%) in need of representation (Mark Twain Figure 4). Two unrepresented alliances have low-quality occurrences on Missouri Designated Natural Areas:

- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (large patch, Tunnel Bluff Woods)
- Black Ash - Red Maple Saturated Forest Alliance (small patch, Grasshopper Hollow).

The quality/viability of these occurrences should be verified.

Outer Ozark Border (Subsection 222Ak)

Alliances have not been reported for the estimated 29,727 acres of Mark Twain land in this subsection. Ecosystems cannot be represented until alliances have been identified on national forest land.

Central Plateau (Subsection 222Ab)

Of 10 alliances, 4 are represented, leaving 6 alliances (60%) in need of representation (Mark Twain Figure 4). The unrepresented matrix type may be the highest priority for RNA establishment (and other matrix alliances may yet be identified):

- White Oak - (Red Oak, Hickory species) Forest Alliance.

One unrepresented large patch alliance has low-quality occurrences on 2 Missouri Designated Natural Areas:

- Post Oak Flatwoods Forest Alliance.

The quality/viability of these occurrences should be verified.

St. Francis Knobs and Basins (Subsection 222Aa)

Only 2 alliances have been identified on national forest land in this subsection, and both are represented (Mark Twain Figure 4).

Inner Ozark Border (Subsection 222Aj)

Only one alliance has been identified on national forest land in this subsection, and it is not currently represented (Mark Twain Figure 4):

- Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance.

This alliance does have low-quality occurrences on 2 Missouri Designated Natural Areas (Mark Twain Appendix B); the quality/viability of these occurrences should be verified.

Claypan Till Plain (Subsection 251Cd)

Alliances have not been reported for the estimated 5,955 acres of Mark Twain land in this subsection. No ecosystems can be represented until alliances have been identified on national forest land.

Springfield Plain (Subsection 222Am)

Alliances have not been reported for the estimated 3,330 acres of Mark Twain land in this subsection. No ecosystems can be represented until alliances have been identified on national forest land.

White and Black Rivers Alluvial Plain (Subsection 234Ac)

No alliances have been reported from the estimated 2,131 acres of Mark Twain land in this subsection. No ecosystems can be represented until alliances have been identified on national forest land.

MARK TWAIN TABLES

Mark Twain Table 1. Established research natural areas (RNAs) of the Mark Twain National Forest

RNA	Acres	Subsection	Established
none			

Mark Twain Table 2. Designations identified to date as RNA-equivalents for the Mark Twain National Forest

Protected Area Designation	Managed by
State Designated Natural Areas	Missouri Natural Areas Committee
Nature Preserves	The Nature Conservancy
Wilderness Areas	USDA Forest Service

Mark Twain Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Mark Twain National Forest

The Mark Twain may work with these organizations to consider RNA-equivalency (see Methods).

Protected Area Designation	Managed by
National Scenic Riverways	National Park Service
USFWS Wilderness Areas	US Fish and Wildlife Service

Mark Twain Table 4. Subsections of the Mark Twain National Forest, in order of prominence

"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance is NF acres divided by Mark Twain total ownership, and these percents do add to 100, within rounding error. All values are approximate. See also Mark Twain Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF in subsection
222Af—Current River Hills	1,563,346	259,250	17	17
222Al—Black River Ozark Border	959,930	155,922	16	10
222Ad—Gasconade River Hills	1,098,670	172,451	15.7	12
222Ae—Meramec River Hills	1,136,253	165,109	14.5	11
222Ag—White River Hills	3,086,148	335,422	11	22
222Aa—St. Francis Knobs and Basins	1,107,540	117,333	10.6	8
222Ab—Central Plateau	6,643,921	230,396	3	15
222Ak—Outer Ozark Border	2,149,987	29,727	1.4	2
222Aj—Inner Ozark Border	1,886,603	17,191	0.9	1
251Cd—Claypan Till Plain	2,969,223	5,955	0.2	0.4
222Am—Springfield Plain	3,298,624	3,330	0.1	0.2
234Ac—White and Black Rivers Alluvial Plain	2,590,564	2,131	0.08	0.1
Mark Twain total ownership:		1,494,217		

Mark Twain Table 5. Subsections and alliances of the Mark Twain National Forest (NF) and their representation by RNAs and RNA-equivalents

Alliances are listed by their community pattern (matrix, large patch, and small patch), and subsections are sorted by NF prominence (see Mark Twain Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) CRH= Current River Hills, BR= Black River Ozark Border, GRH= Gasconade River Hills, MRH= Meramec River Hills, WRH= White River Hills, SF= St. Francis Knobs and Basins, CP= Central Plateau, OOB= Outer Ozark Border, IOB= Inner Ozark Border, CTP= Claypan Till Plain, SP= Springfield Plain, WB= White and Black Rivers Alluvial Plain. For a list of alliances occurring in subsections of the Mark Twain NF subsections but not reported on NF land, see Mark Twain Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Mark Twain NF--

Community Pattern **Alliances Reported on NF Land**	222Af (CRH)		222Al (BR)		222Ad (GRH)		222Ae (MRH)		222Ag (WRH)		222Aa (SF)		222Ab (CP)		222Ak* (OOB)		222Aj* (IOB)		251Cd* (CTP)		222Am* (SP)		234Ac* (WB)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
White Oak - (Red Oak, Hickory species) Forest Alliance	(2) ▪	(4)	▪		▪		▪	(2)	(1) ▪	(1)	(3) ▪		▪		(1) ▪	(2)	▪					(1)		
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance	(6) ▪	(3)	▪		(1) ▪	(1)			(2) ▪		(2) ▪	(2)	▪		▪			(2)						
Post Oak - Blackjack Oak Forest Alliance	(5) ▪				▪		▪		(1) ▪		(2) ▪		▪		(1) ▪		(1) ▪				(1) ▪			
Post Oak Flatwoods Forest Alliance	(1) ▪						▪						▪	(2)										
Sugar Maple - American Basswood - (Red Oak) Forest Alliance	▪						(1) ▪		▪		(1) ▪				▪		▪							
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance	(3) ▪	(2)	(1) ▪		▪		▪		▪	(1)		▪			(3) ▪		▪				▫			
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance			(2) ▪																					

* We were unable to obtain data about alliances on national forest land in these subsections.

--Subsections of Mark Twain NF--

Community Pattern **Alliances Reported on NF Land**	222Af (CRH)	222Al (BR)	222Ad (GRH)	222Ae (MRH)	222Ag (WRH)	222Aa (SF)	222Ab (CP)	222Ak* (OOB)	222Aj* (IOB)	251Cd* (CTP)	222Am* (SP)	234Ac* (WB)
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	▪ (1)		▪	▪ (2)				▪	▪		▪	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance	▪	(1) ▪			▪	▪	(2) ▪ (1)		▪			
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance	(1) ▪	(1) ▪					(2) ▪					
Little Bluestem - Indian Grass Herbaceous Alliance				▪	▪		(1) ▪	▪			(3) ▪	

Small Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Black Ash - Red Maple Saturated Forest Alliance	▪	(1)	▪		▪		▪				(1)	▪										
Buttonbush Semipermanently Flooded Shrubland Alliance	(2)	▪	▪		▪				▪				▪							▪		
Little Bluestem - (Three-awn) Herbaceous Alliance	(5)	▪			▪		▪				(5)	▪ (1)	▪		▪ (1)		(1)	▪		(3)	▪	
Little Bluestem - Side-oats Grama Herbaceous Alliance	(2)	▪	▪		(1)	▪	(2)	▪	(4)	▪	(1)	▪	(1)	▪	▪		(2)	▪		(2)	▪	
Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous Alliance	(5)	▪							▪				(2)	▪						▪		
Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated	(7)	▪	▪		▪		(1)	▪	(1)	▪	(1)	▪	▪									
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance									▪				▪		▪		▪			▪		
Open Bluff/Cliff Sparse Vegetation	(2)	▪			(1)	▪	(2)	▪	(2)	▪	(5)	▪			(2)	▪		▪			▪	

* We were unable to obtain data about alliances on national forest land in these subsections.

Mark Twain Table 6. RNAs and RNA-equivalents of the Mark Twain National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)		
		USDA Forest Service Wilderness Areas	Missouri Designated Natural Areas	TNC Preserves of Missouri
222Af		• Irish Wilderness (west 1/3)	• Big Barren Creek (232) • Big Springs Pines (345) • Blair Creek Raised Fen (3) • Brushy Pond (28) • Bur Oak Basin (230) • Gilmore Pond (10) • Grasshopper Hollow (593) • Grassy Pond (1) • Husman Fen (1) • Jacks Fork (966) • Lily Pond (8) • Mill Mountain (180) • Montauk Upland Forest (40) • Mule Hollow Glade (44) • Pioneer (20) • Prairie Hollow Gorge (74) • Red Maple Pond (84) • Stegall Mountain (5,387) • Sunklands (160) • Tunnel Bluff Woods (288) • Wells Branch Fen (2)	• Alton Box–Bat Cave • Alton Box–Pulltite • Chilton Creek • Grasshopper Hollow • Lily Pond • Shut-In Mountain Fens • Thorny Mountain
222Al			• Blue Pond (15) • Mud Creek (1,038) • Poplar Bluff Forest (80)	
222Ad		• Paddy Creek (east 2/3)	• Clifty Creek (230) • Eck Memorial (265) • Horseshoe Bend (69) • Spring Creek Gap Glades (40)	
222Ae			• Coonville Creek (49) • Meramec Upland Forest (461) • Spring's End Forest (15) • Washington State Park Hardwoods (68)	• Zahorsky Woods
222Ag		• Devil's Backbone • Hercules Glade • Piney Creek	• Ashe Juniper (31) • Butler Hollow Glades (385) • Caney Mountain (1,330) • Carman Springs (2,810) • Haden Bald (40) • Roaring River Cove Hardwoods (120) • Rock Spring Bluff (20) • White River Balds (362)	• Alma Peterson Azalea Memorial • NL Williams Woods

(cont.)

(cont. from previous page)

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)		
		USDA Forest Service Wilderness Areas	**Missouri Designated Natural Areas**	**TNC Preserves of Missouri**
222Aa		• Bell Mountain • Rock Pile Mountain	• Buck Mountain (120) • Castor River Shut-ins (209) • Hickory Canyons (981) • Hughes Mountain (392) • Johnson's Shut-ins Dolomite Glade (18) • Johnson's Shut-ins Fen (8) • Mudlick Mountain (1,370) • Orchid Valley (120) • Pickle Creek (58) • Pickle Springs (257) • Royal Gorge (80) • St. Francois Mountains (7,028)	• Silas Dees Azalea
222Ab		• Irish Wilderness (east 1/3) • Paddy Creek (west 1/3)	• Bald Hill Glade (332) • Cowards Hollow SNA (56) • Cupola Pond (160) • Haney Pond (68) • La Petite Gemme Prairie (37) • Marg Pond (42) • Mint Spring Seep (5) • Overcup Oak (5) • Quercus Flatwoods (48) • Tupelo Gum Pond (32)	• Hyer Woods
222Ak			• Babler Southwoods Hollow (17) • Engelmann Woods (148) • Graham Cave Glades (82) • Vancil Hollow (300)	• Hinkson Valley
222Aj			• Botkins Pine Woods (30) • Lamotte Sandstone Barrens (81) • Valley View Glades (225)	• Victoria Glade
251Cd			• Danville Glades (48)	
222Am			• Bona Glade (20) • Diamond Grove Prairie (611) • Mount Vernon Prairie (41) • Wildcat Glade (32)	• Corry Flatrocks • Greenfield Glade • Mount Vernon Prairie • Rocky Barrens
234Ac			• Allred Lake (76) • Bradyville (139) • Otter Slough (20) • Sand Ponds (68)	

Mark Twain Table 7. Summary of subsection representation on the Mark Twain National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
222Af. Current River Hills		29		8,696	8,696 *<1%*
222Al. Black River Ozark Border		3		1,133	1,133 *<1%*
222Ad. Gasconade River Hills		5		604	604 *<1%*
222Ae. Meramec River Hills		5		593	593 *<1%*
222Ag. White River Hills		13		5,098	5,098 *<1%*
222Aa. St. Francis Knobs and Basins		15		10,640	10,640 *<1%*
222Ab. Central Plateau		13		785	785 *<1%*
222Ak. Outer Ozark Border		5		546	546 *<1%*
222Aj. Inner Ozark Border		4		336	336 *<1%*
251Cd. Claypan Till Plain		1		48	48 *<1%*
222Am. Springfield Plain		8		704	704 *<1%*
234Ac. White and Black Rivers Alluvial Plain		4		303	303 *<1%*
TOTAL	0	105*	0	29,487	29,487

* There are only 103 RNA-equivalents, but the USFS Irish Wilderness is divided between Subsections 222Af and 222Ab, and the USFS Paddy Creek Wilderness is divided between Subsections 222Ad and 222Ab.

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
222Af. Current River Hills	13		9 *69%*	9 *69%*	2
222Al. Black River Ozark Border	5		2 *40%*	2 *40%*	
222Ad. Gasconade River Hills	8		3 *38%*	3 *38%*	
222Ae. Meramec River Hills	3		2 *67%*	2 *67%*	1
222Ag. White River Hills	9		5 *56%*	5 *56%*	1
222Aa. St. Francis Knobs and Basins	2		2 *100%*	2 *100%*	
222Ab. Central Plateau	10		4 *40%*	4 *40%*	1
222Ak. Outer Ozark Border	*unknown*			*?*	
222Aj. Inner Ozark Border	1 *(+)*			*?*	1
251Cd. Claypan Till Plain	*unknown*			*?*	
222Am. Springfield Plain	*unknown*			*?*	
234Ac. White and Black Rivers Alluvial Plain	*unknown*			*?*	

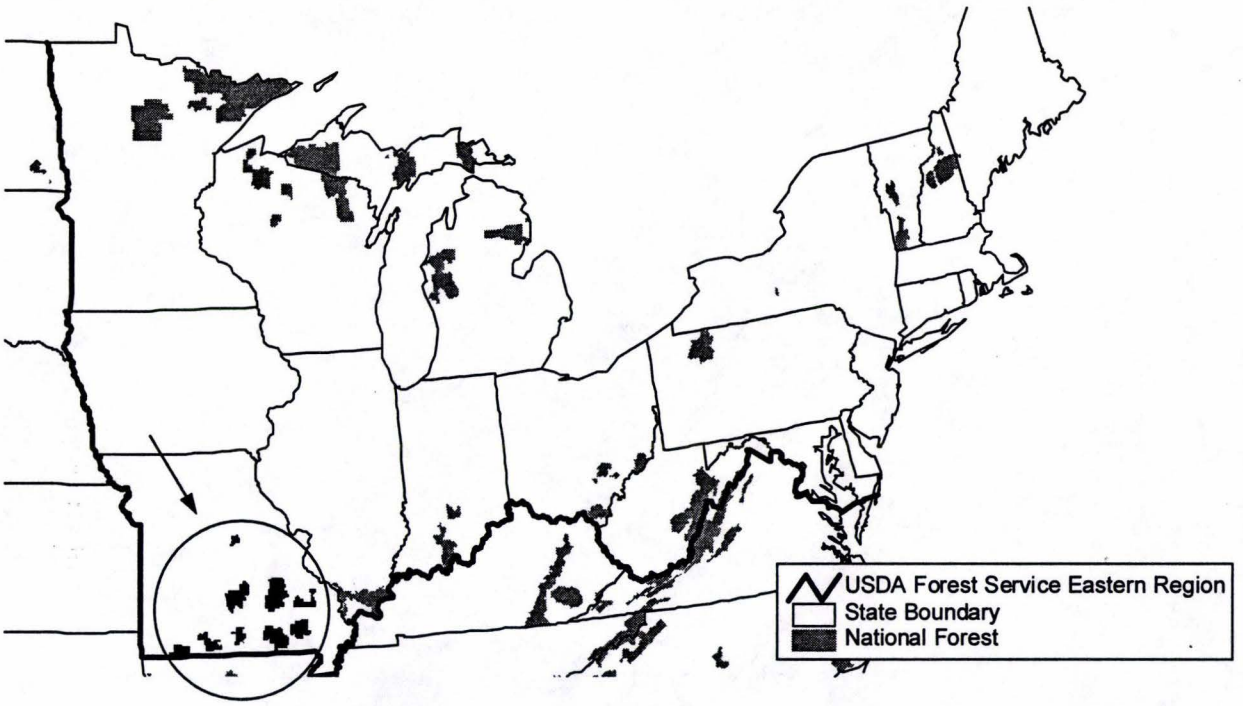
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Mark Twain Table 8. Alliances of the Mark Twain National Forest arranged by community pattern and community distribution

COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC		•Post Oak Flatwoods Forest	
LIMITED		•Sugar Maple - American Basswood - (Red Oak) Forest •Sugar Maple - Red Oak - Bitternut Hickory Forest •Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest	•Little Bluestem - (Three-awn) Herbaceous •Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous
WIDESPREAD	• White Oak - (Red Oak, Hickory species) Forest	•Post Oak - Blackjack Oak Forest •(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest •Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest •Pin Oak - (Swamp White Oak) Seasonally Flooded Forest •Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest •Little Bluestem - Indian Grass Herbaceous	•Black Ash - Red Maple Saturated Forest •Buttonbush Semipermanently Flooded Shrubland •Little Bluestem - Side-oats Grama Herbaceous •Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated Herbaceous •Knotweed - Mixed Forbs Temporarily Flooded Herbaceous •Open Bluff/Cliff Sparsely Vegetated
PERIPHERAL			

MARK TWAIN FIGURES

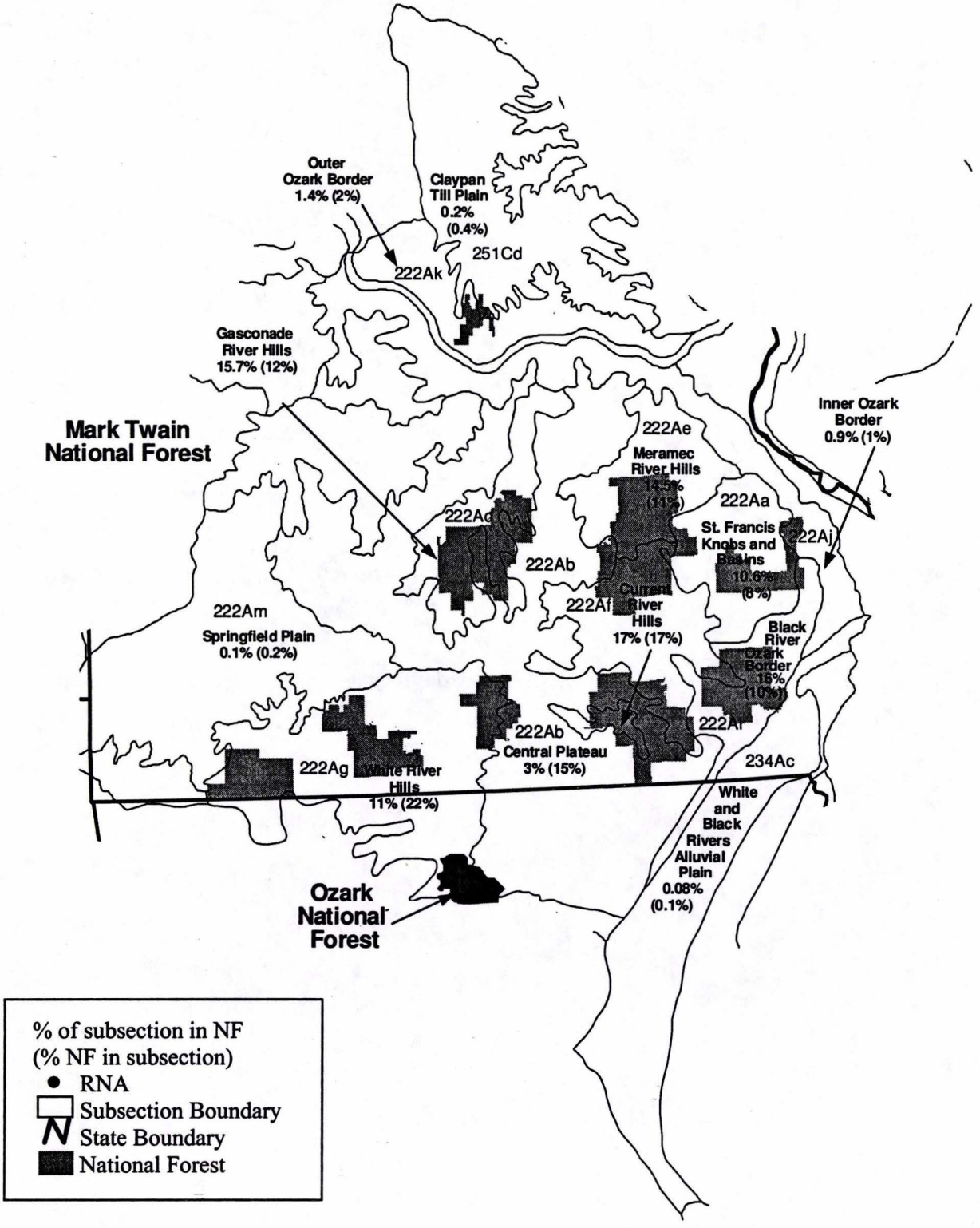
Mark Twain Figure 1. Location of the Mark Twain National Forest.



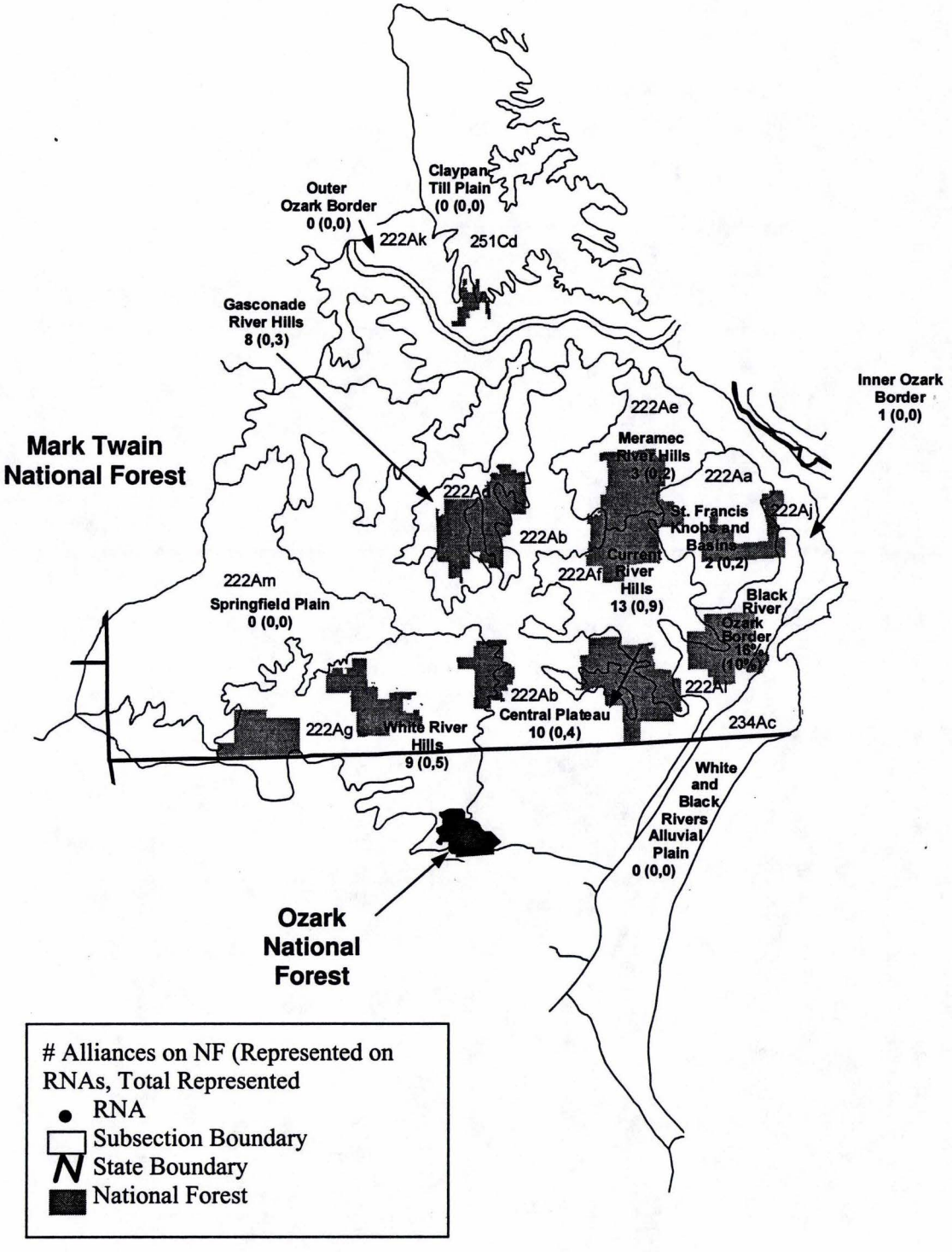
Mark Twain Figure 2. The Mark Twain National Forest with established RNAs and subsections.

A digital copy of the RNA boundaries is available by contacting
the RNA Coordinator of the Eastern Region of the U.S. Forest Service.

Mark Twain Figure 3. Mark Twain National Forest in relation to subsections.
The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percent of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percent of National Forest land (managed) in the subsection



Mark Twain Figure 4. Alliance representation on subsections of the Mark Twain National Forest. The entire National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on national forest land, and in parentheses, the number of these represented by RNAs only followed by the total number represented



Mark Twain Appendix A. Subsections of the Mark Twain National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Mark Twain Table 5 for information on the format of this table. The difference between these two tables is that Mark Twain Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Mark Twain Table 5, i.e. to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Mark Twain NF--

Community Pattern **Alliances not Reported on NF Land**	222Af (CRH)		222Al (BR)		222Ad (GRH)		222Ae (MRH)		222Ag (WRH)		222Aa (SF)		222Ab (CP)		222Ak (OOB)		222Aj (IOB)		251Cd (CTP)		222Am (SP)		234Ac (WB)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
American Beech - Sugar Maple - (Tuliptree) Forest Alliance															▪									
Black Oak - White Oak Forest Alliance	(4)	▪ (1)			▪		(2)	▪	(1)	▪	(1)	▪		▪(1)	▪		▪				▪			
Bur Oak - (White Oak) Wooded Herbaceous Alliance													▪											
Big Bluestem - (Indian Grass) Herbaceous Alliance							▪						▪						▪		▪			
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Red-cedar - (Chinquapin Oak, Post Oak) Forest Alliance	(1)	▪					▪		▪												▫			
Eastern Red-cedar - (Post Oak, Black Oak, Blackjack Oak) Forest Alliance		▪			▪		▪		▪				▪								▫			
Shortleaf Pine Forest Alliance		▪									▪													
Box Elder Temporarily Flooded Forest Alliance																							▪	
Bur Oak - Swamp White Oak - (Big Shellbark Hickory) Temporarily Flooded Forest Alliance									▪				▪											

--Subsections of Mark Twain NF--

Community Pattern **Alliances not Reported on NF Land**	222Af (CRH)	222Al (BR)	222Ad (GRH)	222Ae (MRH)	222Ag (WRH)	222Aa (SF)	222Ab (CP)	222Ak (OOB)	222Aj (IOB)	251Cd (CTP)	222Am (SP)	234Ac (WB)
Eastern Cottonwood Temporarily Flooded Forest Alliance			▪	▪								
Overcup Oak - (Water Hickory) Seasonally Flooded Forest Alliance		▪										
River Birch - (Sycamore) Temporarily Flooded Forest Alliance	▪		▪	▪	▪		▪					
Silver Maple Temporarily Flooded Forest Alliance			▪	▪					▪			
Eastern Red-cedar Woodland Alliance	▪		▪	▪	▪						▫	
Bur Oak - Oak (White, Northern Pin, Black) Woodland Alliance								▪				
Chinquapin Oak Woodland Alliance	(1) ▪				▪		▪	▪			▪ (2)	
Post Oak - Blackjack Oak Woodland Alliance	▪				▪		▪	▪			▪	
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance							▪		(1) ▪		▫	
Black Willow Temporarily Flooded Shrubland Alliance					▪		▪					
Carolina Willow Temporarily Flooded Shrubland Alliance	▪			▪	▪	▪						
Big Bluestem - (Canada Bluejoint, Switchgrass) Herbaceous Alliance							▪			▪	▪	
Prairie Cordgrass Temporarily Flooded Herbaceous Alliance							▪					
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance								▪				
River Bulrush Seasonally Flooded Herbaceous Alliance							▪	▪				
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance					▪		▪				▪	
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Cane Temporarily Flooded Shrubland Alliance					▪		▪					

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Mark Twain NF--											
	222Af (CRH)	222Al (BR)	222Ad (GRH)	222Ae (MRH)	222Ag (WRH)	222Aa (SF)	222Ab (CP)	222Ak (OOB)	222Aj (IOB)	251Cd (CTP)	222Am (SP)	234Ac (WB)
Ashe Juniper Woodland Alliance					(1) ▪							
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	▪		▪	▪	▪	▪					▫	
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance					▪		▪					
Kudzu Vine-Shrubland Alliance					▪		▪					
Muscadine Grape - Peppervine - Trumpet-creeper Seasonally Flooded Vine-Shrubland Alliance												▪
Spring Witch-hazel Temporarily Flooded Shrubland Alliance	▪			▪	▪	▪						
Little Bluestem - (Tall Dropseed, Prairie Dropseed, Sandhill Dropseed) Herbaceous Alliance					▪		▪					
Inland Saltgrass - (Foxtail Barley) Temporarily Flooded Herbaceous Alliance								▪	▪			
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance		▪				(1) ▪	(1) ▪					
American Lotus Semipermanently Flooded Herbaceous Alliance					▪		▪					
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance					▪		▪					
Small Eroding Cliffs/Banks Sparse Vegetation										▪		
Lowland Talus Sparse Vegetation	▪			▪ (1)	▪	▪						
Gravel Wash Sparse Vegetation	▪		▪	▪		▪						
Sand Flats Temporarily Flooded Sparse Vegetation	▪		▪	▪				▪				

Mark Twain Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Mark Twain National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L Rank	?
Subsection 222Af. Current River Hills					
Matrix Alliances					
Black Oak - White Oak Forest Alliance		Alton Box - Pulltite	95	B AB BC B	
		Chilton Creek	2,200	B AB BC B	
		Grasshopper Hollow	20	D AB BC BC	
		Shut-In Mountain Fens	250	C AB BC B	
		Thorny Mountain	475	B AB BC B	
White Oak - (Red Oak, Hickory species) Forest Alliance		Alton Box - Bat Cave	9	D AB BC C	
		Alton Box - Pulltite	25	D AB BC BC	
		Chilton Creek	1,200	B AB BC AB	
		Grasshopper Hollow	40	D AB BC BC	
		Montauk Upland Forest Designated Natural Area	25	D B B BC	
		Shut-In Mountain Fens	160	C AB BC B	
Large Patch Alliances					
Eastern Red-cedar - (Chinquapin Oak, Post Oak) Forest Alliance		Pioneer Designated Natural Area	6	CAB? BC B	
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance		Big Spring Pines Designated Natural Area	150	C B B B	
		Chilton Creek	500	B AB B B	
		Grasshopper Hollow	10	D AB B BC	
		Montauk Upland Forest Designated Natural Area	15	D B B BC	
		Prairie Hollow Gorge Designated Natural Area	13	C B+ B B	
		Shut-In Mountain Fens	50	B AB BC B	
		Stegall Mountain Designated Natural Area	30	D B+ B BC	
		Thorny Mountain	175	B AB BC B	
		Tunnel Bluff Woods Designated Natural Area	15	B B B B	
Post Oak - Blackjack Oak Forest Alliance		Chilton Creek	1,500	A AB BC A	
		Mill Mountain Designated Natural Area	10	B B BC B	
		Prairie Hollow Gorge Designated Natural Area	7	B B BC B	
		Shut-In Mountain Fens	45	B AB BC B	
		Thorny Mountain	235	A AB BC A	
Post Oak Flatwoods Forest Alliance		Lily Pond	5	D AB BC B	
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Alton Box - Bat Cave	1	D AB BC C	
		Alton Box - Pulltite	45	C AB BC B	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Big Barren Creek Designated Natural Area	10	C	B	B	BC	
		Chilton Creek	100	B	AB	B	B	
		Grasshopper Hollow	10	C	AB	B	B	
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		Tunnel Bluff Woods Designated Natural Area	35	C	B	BC	BC	
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance		Red Maple Pond Designated Natural Area	2	C	A	B	B	
Chinquapin Oak Woodland Alliance		Chilton Creek	50	B	AB	BC	B	
Small Patch Alliances								
Black Ash - Red Maple Saturated Forest Alliance		Grasshopper Hollow Designated Natural Area	4	C	C+	B	BC	
Buttonbush Semipermanently Flooded Shrubland Alliance		Lily Pond	3	C	AB	BC	B	
		Lily Pond Designated Natural Area	2	C	A	BC	B	
Little Bluestem - (Three-awn) Herbaceous Alliance		Mill Mountain Designated Natural Area	20	B	A-B	BC	A	
		Prairie Hollow Gorge Designated Natural Area	10	B	B	BC	B	
		Shut-In Mountain Fens	5	B	AB	BC	B	
		Stegall Mountain Designated Natural Area	192	A	AB	B	A	
		Thorny Mountain	75	A	AB	BC	A	
Little Bluestem - Side-oats Grama Herbaceous Alliance		Chilton Creek	50	A	AB	BC	A	
		Mule Hollow Glade Designated Natural Area	8	B	B	BC	B	
		Stegall Mountain Designated Natural Area		U	U	B	U	
Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous Alliance		Brushy Pond Designated Natural Area	2	C	B	B	B	
		Burr Oak Basin Designated Natural Area	5	B	B-C	BC	B	
		Gilmore Pond Designated Natural Area	5	B	B	BC	B	
		Grassy Pond Designated Natural Area	0	D	A	BC	B	
		Sunklands Designated Natural Area	2	C	B+	BC	B	
Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated Herbaceous Alliance		Blair Creek Raised Fen Designated Natural Area	1	C	B	B	B	
		Chilton Creek	20	B	AB	B	B	
		Grasshopper Hollow	60	B	AB	B	B	
		Grasshopper Hollow Designated Natural Area	24	B	A-D	B	B	
		Husman Fen Designated Natural Area	1	C	B+	B	B	
		Shut-In Mountain Fens	10	B	AB	B	B	
		Wells Branch Fen Designated Natural Area	1	C	A/B	B	B	
Open Bluff/Cliff Sparse Vegetation		Jacks Fork Designated Natural Area		U	A	B	AB	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Open Bluff/Cliff Sparse Vegetation		Prairie Hollow Gorge Designated Natural Area		U A B	B
		Current River Hills (222Af) Total:	8,018		

Subsection 222Al. Black River Ozark Border

Large Patch Alliances

Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Mud Creek Designated Natural Area	157	B B B	B
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance		Mud Creek Designated Natural Area	157	B B B	B
		Poplar Bluff Forest Designated Natural Area	44	B BD BC	B
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Poplar Bluff Forest Designated Natural Area	1	C B BC	B
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance		Blue Pond Designated Natural Area	1	C A BC	B
		Black River Ozark Border (222Al) Total:	360		

Subsection 222Ad. Gasconade River Hills

Large Patch Alliances

Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance		Eck Memorial Designated Natural Area	230	C A/B B	B
		Horseshoe Bend Designated Natural Area	15	D B- B	BC

Small Patch Alliances

Little Bluestem - Side-oats Grama Herbaceous Alliance		Spring Creek Gap Glades Designated Natural Area	10	B B BC	B
Open Bluff/Cliff Sparse Vegetation		Clifty Creek Designated Natural Area		U B B	B
		Gasconade River Hills (222Ad) Total:	255		

Subsection 222Ae. Meramec River Hills

Matrix Alliances

Black Oak - White Oak Forest Alliance		Meramec Upland Forest Designated Natural Area	337	B A-B B	AB
		Zahorsky Woods	20	C AB BC	B
White Oak - (Red Oak, Hickory species) Forest Alliance		Meramec Upland Forest Designated Natural Area	7	D B-C B	C
		Zahorsky Woods	12	D AB BC	BC

Large Patch Alliances

Sugar Maple - American Basswood - (Red Oak) Forest Alliance		Washington State Park Hardwoods Designated Na	68	B B BC	B
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		Spring's End Forest Designated Natural Area	14	C B BC	BC
		Zahorsky Woods	20	C B BC	BC

Small Patch Alliances

Little Bluestem - Side-oats Grama Herbaceous Alliance		Meramec Upland Forest Designated Natural Area	15	B A-B B	B
		Zahorsky Woods	2	C AB BC	B
Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated Herbaceous Alliance		Coonville Creek Designated Natural Area	9	B A-C BC	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Open Bluff/Cliff Sparse Vegetation		Meramec Upland Forest Designated Natural Area		U A B	B
		Zahorsky Woods	2	C AB BC	B
Lowland Talus Sparse Vegetation		Meramec Upland Forest Designated Natural Area		U C B	BC
		Meramec River Hills (222Ae) Total:	506		

Subsection 222Ag. White River Hills

Matrix Alliances

Black Oak - White Oak Forest Alliance		Roaring River Cove Hardwoods Designated Na		U AB BC	B
White Oak - (Red Oak, Hickory species) Forest Alliance		Caney Mountain Designated Natural Area	230	C B/A B	B
		Roaring River Cove Hardwoods Designated Na	25	D B BC	BC

Large Patch Alliances

Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance		Alma Peterson Azalea Memorial	3	D AB BC	B
		NL Williams Woods	40	C AB B	B
Post Oak - Blackjack Oak Forest Alliance		Caney Mountain Designated Natural Area	110	B B B	B
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Carman Springs Designated Natural Area	30	C B B	BC

Small Patch Alliances

Ashe Juniper Woodland Alliance		Ashe Juniper Designated Natural Area	25	C B BC	B
Little Bluestem - Side-oats Grama Herbaceous Alliance		Butler Hollow Glades Designated Natural Area	35	B A B	AB
		Caney Mountain Designated Natural Area	77	A BC B	B
		Haden Bald Designated Natural Area	15	B B BC	B
		White River Balds Designated Natural Area	100	A B BC	B
Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated Herbaceous Alliance		Carman Springs Designated Natural Area	1	C A/B B	B
Open Bluff/Cliff Sparse Vegetation		Carman Springs Designated Natural Area	7	B A B	B
		Rock Spring Bluff Designated Natural Area	10	B A B	B
		White River Hills (222Ag) Total:	708		

Subsection 222Aa. St. Francis Knobs and Basins

Matrix Alliances

Black Oak - White Oak Forest Alliance		Mudlick Mountain Designated Natural Area	300	B A B	B
White Oak - (Red Oak, Hickory species) Forest Alliance		Buck Mountain Designated Natural Area	45	CD B B	B
		Hickory Canyons Designated Natural Area	76	C?+/B B	B
		Mudlick Mountain Designated Natural Area	400	C B B	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Large Patch Alliances								
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance		Hickory Canyons Designated Natural Area	58	B	C+/B	B	B	
		Pickle Creek Designated Natural Area	30	C	B	B	B	
		Pickle Springs Designated Natural Area	66	C	C-B	B	BC	
		Silas Dees Azalea	5	D	AB	BC	BC	
Post Oak - Blackjack Oak Forest Alliance		Buck Mountain Designated Natural Area	25	B	B	BC	B	
		Hughes Mountain Designated Natural Area	10	B	A	B	B	
Sugar Maple - American Basswood - (Red Oak) Forest Alliance		Hickory Canyons Designated Natural Area	76	B	B	B	B	
Small Patch Alliances								
Black Ash - Red Maple Saturated Forest Alliance		Johnson's Shut-ins Fen Designated Natural Area	8	B	A	B	B	
Little Bluestem - (Three-awn) Herbaceous Alliance		Buck Mountain Designated Natural Area	16	B	B+	BC	B	
		Castor River Shut-ins Designated Natural Area		U	A	BC	B	
		Hughes Mountain Designated Natural Area	73	A	A	B	A	
		Mudlick Mountain Designated Natural Area	10	B	A	B	A	
		Pickle Springs Designated Natural Area	3	C	C/C-	B	BC	
		St. Francois Mountains Designated Natural Area	691	A	B	B	AB	
Little Bluestem - Side-oats Grama Herbaceous Alliance		Johnson's Shut-ins Dolomite Glade Designated Na	20	B	B-C	B	B	
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance		Orchid Valley Designated Natural Area	0	D	B	BC	B	
Sallow Sedge - Little Bog Sedge (Prickly Bog Sedge, Inland Sedge, Largeleaf Grass-of-Parnassus) Saturated Herbaceous Alliance		Johnson's Shut-ins Fen Designated Natural Area	1	C	B	B	B	
Open Bluff/Cliff Sparse Vegetation		Hickory Canyons Designated Natural Area	15	B	A	B	B	
		Mudlick Mountain Designated Natural Area		U	A	B	B	
		Orchid Valley Designated Natural Area		U	B-	B	B	
		Pickle Springs Designated Natural Area		U	C/B	B	B	
		Royal Gorge Designated Natural Area	0	D	B	BC	B	
Gravel Wash Sparse Vegetation		Mudlick Mountain Designated Natural Area			A			
		St. Francis Knobs and Basins (222Aa) Total.	1,928					

Subsection 222Ab. Central Plateau

Matrix Alliances								
Black Oak - White Oak Forest Alliance		Hyer Woods	30	D	AB	BC	BC	
Large Patch Alliances								

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Post Oak Flatwoods Forest Alliance		Overcup Oak Sink Designated Natural Area	2	D	C	BC	C	
		Quercus Flatwoods Designated Natural Area	48	BC	B	BC	BC	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Cupola Pond Designated Natural Area	2	D	B	B	BC	
		Haney Pond Designated Natural Area	3	C	B	B	B	
		Mint Spring Seep Designated Natural Area	5	B	A	BC	B	
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance		Cupola Pond Designated Natural Area	3	C	A	B	B	
		Tupelo Gum Pond Designated Natural Area	1	C	B	B	B	
Little Bluestem - Indian Grass Herbaceous Alliance		La Petite Gemme Prairie Designated Natural Area	36	B	B+	BC	B	
Small Patch Alliances								
Little Bluestem - Side-oats Grama Herbaceous Alliance		Bald Hill Glade Designated Natural Area	55	A	A-C	B	AB	
Comosa Sedge - (Decomposite Sedge) Semipermanently Flooded Herbaceous Alliance		Marg Pond Designated Natural Area	2	C	A	B	B	
		Tupelo Gum Pond Designated Natural Area	4	C	A	B	B	
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance		Mint Spring Seep Designated Natural Area	0	D	A	BC	B	
		Central Plateau (222Ab) Total:	191					

Subsection 222Ak. Outer Ozark Border

Matrix Alliances								
White Oak - (Red Oak, Hickory species) Forest Alliance		Babler Southwoods Hollow Designated Natural Area	19	D	B	B	BC	
		Engelmann Woods Designated Natural Area	68	C	B	B	B	
		Hinkson Valley	35	D	AB	BC	BC	
Large Patch Alliances								
Post Oak - Blackjack Oak Forest Alliance		Graham Cave Glades Designated Natural Area	8	C	B-C	BC	B	
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Babler Southwoods Hollow Designated Natural Area	19	C	B	B	B	
		Engelmann Woods Designated Natural Area	41	C	A-B	B	B	
		Vancil Hollow Designated Natural Area	100	B	B	B	B	
Small Patch Alliances								
Little Bluestem - (Three-awn) Herbaceous Alliance		Graham Cave Glades Designated Natural Area	10	B	B-C	BC	BC	
Open Bluff/Cliff Sparse Vegetation		Engelmann Woods Designated Natural Area		U	A	B	B	
		Graham Cave Glades Designated Natural Area	3	C	B/C	B	B	
		Outer Ozark Border (222Ak) Total:	303					

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank ?
Subsection 222Aj. Inner Ozark Border							
Large Patch Alliances							
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance		Botkins Pine Woods Designated Natural Area	30	C	B	BC	BC
		Lamotte Sandstone Barrens Designated Natural Area	24	B	BC	BC	BC
Post Oak - Blackjack Oak Forest Alliance		Lamotte Sandstone Barrens Designated Natural Area	41	B	B+	BC	B
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance		Victoria Glade	55	B	AB	BC	B
Small Patch Alliances							
Little Bluestem - (Three-awn) Herbaceous Alliance		Lamotte Sandstone Barrens Designated Natural Area	16	B	B	BC	B
Little Bluestem - Side-oats Grama Herbaceous Alliance		Valley View Glades Designated Natural Area	307	A	AB	BC	A
		Victoria Glade	45	B	AB	BC	B
		Inner Ozark Border (222Aj) Total:	518				
Subsection 251Cd. Claypan Till Plain							
White Oak - (Red Oak, Hickory species) Forest Alliance		Danville Glades Designated Natural Area	42	D	A-C	B	B
Little Bluestem - Side-oats Grama Herbaceous Alliance		Danville Glades Designated Natural Area	6	B	A-B	BC	B
		Claypan Till Plain (251Cd) Total:	48				
Subsection 222Am. Springfield Plain							
Matrix Alliances							
White Oak - (Red Oak, Hickory species) Forest Alliance		Rocky Barrens	29	D	BC	BC	BC
Large Patch Alliances							
Post Oak - Blackjack Oak Forest Alliance		Corry Flatrocks	20	B	AB	BC	B
Chinquapin Oak Woodland Alliance		Greenfield Glade	17	C	BC	BC	BC
		Rocky Barrens	28	C	B	BC	BC
Little Bluestem - Indian Grass Herbaceous Alliance		Diamond Grove Prairie Designated Natural Area	782	A	B	BC	B
		Mount Vernon Prairie	40	B	AB	BC	B
		Mount Vernon Prairie Designated Natural Area	40	B	B-C	BC	B
Small Patch Alliances							
Little Bluestem - (Three-awn) Herbaceous Alliance		Bona Glade Designated Natural Area	4	C	B	BC	B
		Corry Flatrocks	20	B	AB	BC	B
		Wildcat Glade Designated Natural Area	13	B	B-C	BC	B
Little Bluestem - Side-oats Grama Herbaceous Alliance		Greenfield Glade	30	B	AB	BC	B
		Rocky Barrens	12	B	AB	BC	B
		Springfield Plain (222Am) Total:	1,035				

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 234Ac. White and Black Rivers Alluvial Plain								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Sand Ponds Designated Natural Area	31	C	AB	BC	B	
Bald-cypress Semipermanently Flooded Forest Alliance		Allred Lake Designated Natural Area	48	CD	AB	BC	BC	
		Otter Slough Designated Natural Area	5	D	B	B	BC	
Overcup Oak - (Water Hickory) Seasonally Flooded Forest Alliance		Allred Lake Designated Natural Area	21	C	A	BC	B	
Red Maple - Green Ash Seasonally Flooded Forest Alliance		Bradyville Designated Natural Area	4	D	B	BC	BC	
		Sand Ponds Designated Natural Area	14	C	AB	BC	B	
Willow Oak Seasonally Flooded Forest Alliance		Bradyville Designated Natural Area	135	B	C+	BC	B	
		Sand Ponds Designated Natural Area	9	C	AB	BC	B	
Buttonbush Semipermanently Flooded Shrubland Alliance		Otter Slough Designated Natural Area	10	C	A	BC	B	
		White and Black Rivers Alluvial Plain (234Ac) Total.	277					
		Grand Total:	14,147					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.

* Rank assignment is uncertain.

Mark Twain Appendix C. Unrepresented alliances (Forest-wide) on the Mark Twain National Forest

The following alliances are not represented in any of the subsections in which they occur on Mark Twain land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- Post Oak Flatwoods Forest Alliance (large patch, endemic)
- Sugar Maple - American Basswood - (Red Oak) Forest Alliance (large patch, limited)
- Post Oak - Blackjack Oak Forest Alliance (large patch, widespread)
- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (large patch, widespread)
- Little Bluestem - Indian Grass Herbaceous Alliance (large patch, widespread)
- Black Ash - Red Maple Saturated Forest Alliance (small patch, widespread)

IX. I. Monongahela National Forest RNA Assessment

MONONGAHELA SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Monongahela National Forest. **The Monongahela results are preliminary, as not all aspects of the assessment could be thoroughly conducted.** An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Monogahela National Forest lands. The Monongahela National Forest occupies portions of 7 subsections. Based on data from the 3 dominant subsections, at least 43 alliances occur on Monongahela lands, with the number of alliances in each subsection ranging from 13 to 29. In these 3 subsections there are 43 alliance-subsection combinations; these are the ecosystems to represent identified to date for the Monongahela. Data still need to be compiled for the 4 minor subsections.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

There are no currently established RNAs in the Monongahela National Forest.

Existing **RNA-equivalents** identified to date in 4 of the 7 subsections include:

- 4 U.S. Forest Service Wilderness Areas (RNA-equivalency status needs review),
- 2 West Virginia State Natural Areas, and
- 8 preserves of The Nature Conservancy.

These 14 RNA-equivalents currently represent 2 (5%) of the Monongahela alliance-subsection combinations (ecosystems). The number of represented ecosystems is possibly larger because RNA-equivalents have not been thoroughly identified and community data were not available for all identified RNA-equivalents. Identifying alliances in these and additional protected areas could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTED ECOSYSTEMS

The Monongahela has 63 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling gaps in representation include:

- confirming ecosystems to represent in the 7 subsections
- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing RNAs on the Monongahela National Forest, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Monongahela National Forest are:

- Northern High Allegheny Mountain (M221Ba)
- Southern High Allegheny Mountain (M221Bc), and
- Eastern Allegheny Mountain and Valley (M221Bd)

The Monongahela has high prominence (> 35%) in these subsections, and very little of the biological diversity (fewer than 5% of the alliances) is represented in each.

A **medium-priority subsection** is the Western Allegheny Mountains (M221Bb). Monongahela prominence in this subsection is less than 10%. Alliances have yet to be identified in this subsection.

Low-priority subsections are West Allegheny Mountain and Valley (M221Be), Eastern Coal Fields (M221Cb), and Appalachian Ridges (M221Aa), because Monongahela prominence is less than 4% in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there are 2 **high-priority alliances** (of 43 Monongahela alliances). These may be high-priority in each subsection in which they occur. Both are not represented in *any* subsection in which they occur on Monongahela land:

- Rock Chestnut - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance

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IX.I.1. INTRODUCTION

This report is preliminary, as not all aspects of the assessment could be thoroughly conducted.

The Monongahela National Forest is located in eastern West Virginia (Monongahela Figure 1) and small portions of Virginia. Its proclamation boundaries and purchase unit boundaries contain 1,673,590 acres, with 902,858 acres (54%) of this land currently (FY97) managed by the Monongahela.

The Monongahela National Forest occurs entirely in Province M221 (Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow Province). Appendix VIII lists the other national forests in the Province. The Monongahela National Forest can work with the other national forests in this Province to evaluate province-wide representation and establish priorities for the Province.

IX.I.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Monongahela.

IX.I.2.a. Subsections

We identified the subsections occurring on the Monongahela National Forest using the digital subsection map of Keys *et al.* (1995) produced at a scale of 1:3,500,000 and a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo). We used the digital maps to determine the amount of land in each subsection within national forest boundaries. To estimate ownership acreage within each subsection, we multiplied these values by 54%, the fraction of ownership to proclamation acres for the entire Monongahela Mountain National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with national forest land (ownership).

We used these digital maps to determine the amount of land in each subsection within Monongahela proclamation boundaries and purchase units. To estimate ownership acreage within each subsection, we multiplied these values by 54%, the fraction of ownership to proclamation acres for the entire Monongahela National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with national forest land (ownership).

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percent of national forest land in a subsection gives an indication of the dominance of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.I.2.b. Distribution of alliances among subsections

To create the list of alliances for Monongahela subsections, Mark Anderson of the The Nature Conservancy's Eastern Conservation Science Division provided us with a 1994 alliance-by-subsection list that was developed by The Nature Conservancy and state Natural Heritage Programs. This list was updated to incorporate changes in the classification (Grossman *et al.* 1998). A list of West Virginia Heritage Element Occurrences on RNA-equivalents supplemented the alliance data in four of the seven subsections (M221Ba, M221Bc, M221Bd, and M221Aa).

Because a large portion of subsections M221Ba, M221Bc, and M221Bd is National Forest land, Mark Anderson made the judgement that all alliances identified in these subsections also occur on National Forest land. For these subsections and for M221Aa, Heritage Element Occurrences on Monongahela Wilderness Areas provided additional information about alliances on National Forest land. These lists still need review from Heritage Program and Forest Service personnel. No data about alliances on National Forest land have been compiled for the remaining three subsections (M221Bb, M221Be, and M221Cb).

IX.I.2.c. Identifying RNA-equivalents

Natural areas were identified as RNA-equivalents in discussions with Mark Anderson, using information stored by the West Virginia Natural Heritage Program. The RNA Committee of the Monongahela National Forest should reevaluate the choice of Wilderness Areas as RNA-equivalents. The Committee can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.I.2.d. Digitizing RNAs

Digital information on RNA-equivalents is not yet available. There are currently no established RNAs on the Monongahela, but readers can request from the Regional RNA Coordinator a Region-wide RNA cover at regional projections.

IX.I.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

There are no RNAs on the Monongahela. Limited information on natural communities on RNA-equivalents came from Element Occurrence data stored by the West Virginia Natural Heritage Program. These data are very incomplete.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Monongahela Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Monongahela National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.I.3. PRELIMINARY RESULTS

This section summarizes the preliminary assessment of what alliance-subsection combinations occur on the Monongahela National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.I.3.a. Subsections on national forest land

The 7 subsections which occur on Monongahela National Forest land are listed below. These subsections are listed in order of *prominence*, the percent of the subsection on national forest land (Monongahela Table 4).

- Northern High Allegheny Mountains (M221Ba)
- Southern High Allegheny Mountains (M221Bc)
- Eastern Allegheny Mountain and Valley (M221Bd)
- Western Allegheny Mountains (M221Bb)
- West Allegheny Mountain and Valley (M221Be)

- Eastern Coal Fields (M221Cb)
- Appalachian Ridges (M221Aa)

The majority of the Monongahela National Forest land occurs on 3 subsections (Monongahela Table 4): Northern High Allegheny Mountains (M221Ba), Southern High Allegheny Mountains (M221Bc), and the Eastern Allegheny Mountain and Valley (M221Bd). Together these 3 subsections contain almost 80% of the land in Monongahela ownership. In addition, large portions of these subsections, over 35% in each case, are managed by the Monongahela—*i.e.*, the Monongahela has high *prominence* of land coverage in these subsections.

The National Forest has 11% of its ownership and 3% prominence in the Western Allegheny Mountains (M221Bb). The remaining 3 subsections have very low prominence (<3%).

The Monongahela National Forest shares 2 subsections with the George Washington National Forest in Virginia: M221Bd and M221Aa. It possibly also shares subsection M221Cb with Jefferson National Forest in Virginia. The George Washington and Jefferson National Forests are not included in our Regional Assessment because they are in the Southern rather than the Eastern Region of the USDA Forest Service, and this Assessment was developed for the Eastern Region. However, this does not mean that alliances found on these National Forests in these subsections cannot represent ecosystems for the Mark Twain National Forest. On the contrary, where RNAs or RNA-equivalents protect alliances in the Virginia portion of these subsections, they could fill representation needs. It is hoped that in the future this information could be compiled.

IX.I.3.b. Natural communities within subsections

A total of 81 alliances are reported to occur in these 7 subsections. Alliances on national forest land have only been identified on the 3 dominant Monongahela subsections. 43 alliances have been identified to occur in these 3 subsections, and all are assumed to occur on national forest land (see Methods and Monongahela Table 5, first column). This list requires review. The 38 alliances not reported to occur on national forest land are listed in Monongahela Appendix A; they can be reviewed for their presence on national forest land in the remaining 4 subsections.

Of the 43 alliances identified as occurring on the Monongahela National Forest, 2 are **matrix** alliances (see Monongahela Table 5, first set of alliances), 15 are **large patch** (second set) and 26 are **small patch** (third set). (See "National Vegetation Classification," pp. 8-9.)

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on Monongahela land in each subsection:

- North High Allegheny Mountains (M221Ba): 29 alliances (2 matrix, 9 large patch, 18 small patch)
- South High Allegheny Mountains (M221Bc): 13 alliances (2 matrix, 8 large patch, 3 small patch)
- Eastern Allegheny Mountain & Valley (M221Bd): 22 alliances (2 matrix, 13 large patch, 7 small patch)
- Western Allegheny Mountains (M221Bb): *no national forest alliance data available*
- West Allegheny Mountain & Valley (M221Be) *no national forest alliance data available*
- Eastern Coal Fields (M221Cb): *no national forest alliance data available*
- Appalachian Ridges (M221Aa): *no national forest alliance data available*[*]

There are a total of 65 subsection-alliance combinations identified on Monongahela National Forest land. Monongahela Table 5 shows the alliances that occur in each subsection.

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[*] except for 2 small patch alliances identified by Wilderness Area Element Occurrences

IX.I.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs only in RNA-equivalents, because the Monongahela National Forest currently has no established RNAs (Monongahela Tables 1 and 6). The Forest does have 13 candidate RNAs (cRNAs), but these are not part of the assessment because they do not yet have Level I protection status.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNA-equivalents in each subsection are shown in the appropriate cells of Monongahela Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Monongahela Appendix B for a complete list of alliances occurring on individual RNA-equivalents.

RNA-equivalents

A discussion of what constitutes RNA-equivalents for the Green Mountain and Finger Lakes National Forests has not taken place. However, based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents in this assessment (Monongahela Table 2):

- all State Natural Areas (SNAs)[12], and
- all of The Nature Conservancy's (TNC's) preserves[13].

Monongahela Wilderness Areas are also included as RNA-equivalents in this preliminary assessment, but should be further evaluated. The alliances we have listed for these areas are all Heritage Element Occurrences, so it is likely that they are in less disturbed portions of the Wilderness Areas.

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Monongahela Table 3).

To date, 2 West Virginia state natural areas, 4 U.S. Forest Service Wilderness Areas, and 8 TNC preserves have been used as RNA-equivalents for the Monongahela National Forest assessment (Monongahela Table 6, 7a). The RNA-equivalent status of the Wilderness Areas needs review. Although the acreages of some of the alliances are known on these RNA-equivalents, total acreage of the unit itself is not known, so no acreages are reported in Monongahela Table 7a. A more thorough search for RNA-equivalents is needed.

Northern High Allegheny Mountains (Subsection M221Ba)

Subsection M221Ba contains 4 RNA-equivalents (Monongahela Tables 6, 7a, Monongahela Appendix B), including 3 U.S. Forest Service Wilderness areas (which should be re-evaluated for RNA-equivalency):

- Fisher Spring Run Bog Wilderness
- Red Creek Wilderness
- Stone Coal Run Bog Wilderness

and 1 TNC preserve:

- Sapling Ridge

The acreage of these RNA-equivalents is unknown.

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[12] Keep in mind that the Monongahela National Forest occurs in both West Virginia and Virginia, and RNA-equivalents in both states are relevant.

[13] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

Natural Communities (Alliances)

Of 18 alliances reported to be on national forest land in Subsection M221Ba, 1 is represented by a high-quality (A- or B-ranked) occurrence on an RNA-equivalent (Monongahela Table 5, column M221Ba, Monongahela Table 7b):

- Peatmoss (*Sphagnum recurvum*) Saturated Nonvascular Alliance.

However, this alliance is represented only on Wilderness Areas; these Wilderness Areas need to be re-evaluated for RNA-equivalency.

There is a high-quality occurrence of (Pitch Pine, Monongahela Table Mountain Pine, Virginia Pine) – (Chestnut Oak, Scarlet Oak) Woodland Alliance on Sapling Ridge, but it is not know if this alliance occurs on national forest land in M221Ba (and therefore unknown if it is a ecosystem to represent).

Southern High Allegheny Mountains (Subsection M221Bc)

Subsection M221Bc contains no RNAs, and no RNA-equivalents have been identified (Monongahela Tables 6, 7a). Therefore, no alliances are known to be represented.

Eastern Allegheny Mountain and Valley (Subsection M221Bd)

Subsection M221Bd contains no RNAs, and no RNA-equivalents have been identified. Therefore, no alliances are known to be represented.

Western Allegheny Mountains (Subsection M221Bb)

Subsection M221Bb contains no RNAs, but does contain 4 RNA-equivalents that are TNC preserves (Monongahela Tables 6, 7a):

- Cranesville Swamp
- Finzel Swamp
- Hammel Glade
- The Glades

The acreage of these RNA-equivalents is unknown.

Natural Communities (Alliances)

An assessment of this subsection cannot be performed due to lack of data. The alliances on national forest land in this subsection have yet to be identified. High-quality occurrences of Peatmoss (*Sphagnum recurvum*) Saturated Nonvascular Alliance have been identified on 2 of the preserves, but it is unknown if this alliance occurs on national forest land in subsection M221Bb (and therefore unknown if it is an ecosystem to represent).

West Allegheny Mountain and Valley (Subsection M221Be)

An assessment of this subsection cannot be performed due to lack of data. The alliances on national forest land in this subsection have yet to be identified, and no RNA-equivalents have been identified.

Eastern Coal Fields (Subsection M221Cb)

An assessment of this subsection cannot be performed due to lack of data. The alliances on national forest land in this subsection have yet to be identified, and no RNA-equivalents have been identified.

Appalachian Ridges (Subsection M221Aa)

Subsection M221Aa contains 4 RNA-equivalents (Monongahela Tables 6, 7a, Monongahela Appendix B), including 1 U.S. Forest Service Wilderness area (which should be re-evaluated for RNA-equivalency):

- Salt Pond Mountain Wilderness

2 West Virginia State Natural Areas:

- Johnson Creek State Natural Area Preserve
- Pinnacle State Natural Area Preserve

and 3 TNC preserves:

- Oldtown Romney Shale Glade
- Potts Creek Shale Barren
- Slaty Mountain

The acreage of these RNA-equivalents is unknown.

Natural Communities (Alliances)

Salt Pond Mountain Wilderness contains 2 Heritage Element Occurrences; these are our only information about alliances on national forest land in this subsection. Only one of these is represented by a high-quality (A- or B-ranked) occurrence on the Wilderness Area:

- Red Spruce Saturated Forest Alliance (Monongahela Table 5, column M221Aa, Monongahela Table 7b).

However, the Wilderness Area should be re-evaluated for RNA-equivalency.

The other alliance occurrence ((Prickly Bog Sedge, Star Sedge) – Tawny Cottongrass – Northern Beaksedge – Roughleaf Goldenrod Saturated Herbaceous Alliance) is not represented because of its poor condition.

Two other alliances, (Pitch Pine, Table Mountain Pine, Virginia Pine) – (Chestnut Oak, Scarlet Oak) Woodland Alliance and Chinquapin Oak Woodland Alliance, have high-quality occurrences on the non-wilderness RNA-equivalents, but it is not known if these alliances occur on national forest land in M221Aa (and therefore unknown if they are ecosystems to represent).

IX.I.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Mark Twain National Forest. **These findings are preliminary, as not all aspects of the assessment could be thoroughly conducted.** The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The complete list of needs is shown in Monongahela Table 5 by shaded cells which contain no number. Alliances that are not represented in any Monongahela subsection (unrepresented Forest-wide) are listed in Monongahela Appendix C.

Subsection	Dominance Percentage of Monongahela NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Monongahela NF land	Percentage of NF alliances represented	Proposed priority
M221Ba. Northern High Allegheny Mountains	27	*unknown*	38	3	high
M221Bc. Southern High Allegheny Mountains	32	*unknown*	36	*unknown*	high
M221Bd. Eastern Allegheny Mountain and Valley	20	*unknown*	35	*unknown*	high
M221Bb. Western Allegheny Mountains	11	*unknown*	3	*unknown*	medium
M221Be. West Allegheny Mountain and Valley	2.2	*unknown*	2	*unknown*	low
M221Cb. Eastern Coal Fields	2.1	*unknown*	1.2	*unknown*	low
M221Aa. Appalachian Ridges	6	*unknown*	1	*unknown*	low

The proposed priority order for Monongahela subsections is the same as that of descending prominence of the subsections. There is not enough community information for the National Forest to prioritize based on representation of biological variation. Subsections M221Ba, M221Bc, and M221Bd are high priority because the National Forest has high prominence in these subsections, and 79% of the Forest occurs in these subsections. Although the Monongahela National Forest has low prominence in M221Bb, 11% of the Forest is in the subsection; therefore the subsection has been assigned medium priority. No community information is available for this subsection, and obtaining this information may be high priority.

M221Be, M221Cb, and M221Aa are low-priority subsections based on very low national forest prominence in these subsections. However, these subsections should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

Unrepresented alliances either have not been identified on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented. Many ecosystems to represent may be identified as unrepresented simply due to lack of information.

Northern High Allegheny Mountains (Subsection M221Ba)

Of 29 alliances, 1 is represented, leaving 28 alliances in need of representation. The 2 unrepresented matrix types may be the highest priority for RNA establishment:

- Rock Chestnut - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance

Southern High Allegheny Mountains (Subsection M221Bc)

Of 13 alliances, 0 are represented, leaving 13 alliances in need of representation. The 2 unrepresented matrix types may be the highest priority for RNA establishment:

- Rock Chestnut - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance

Eastern Allegheny Mountain and Valley (Subsection M221Bd)

Of 22 alliances, 0 are represented, leaving 22 alliances in need of representation. The 2 unrepresented matrix types may be the highest priority for RNA establishment:

- Rock Chestnut - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance

Western Allegheny Mountains (Subsection M221Bb)

Alliances have yet to be identified on the national forest land in this subsection.

West Allegheny Mountain and Valley (Subsection M221Be)

Alliances have yet to be identified on the national forest land in this subsection.

Eastern Coal Fields (Subsection M221Cb)

Alliances have yet to be identified on the national forest land in this subsection.

Appalachian Ridges (Subsection M221Aa)

Of the 2 alliances identified for the subsection, 1 is represented. Further work is needed to determine the complete list of alliances on national forest land in this subsection.

MONONGAHELA TABLES

Monongahela Table 1. Established research natural areas (RNAs) of the Monongahela National Forest

RNA	Acres	Subsection	Established
none			

Monongahela Table 2. Designations identified to date as RNA-equivalents for the Monongahela National Forest

Protected Area Designation	Managed by
Wilderness Areas*	U.S. Forest Service
all preserves of The Nature Conservancy (TNC)	The Nature Conservancy
State Natural Areas	West Virginia Division of Natural Resources

*The RNA-equivalent status of these areas should be reviewed.

Monongahela Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Monongahela National Forest

The Monongahela may work with these organizations to consider RNA-equivalency (see Methods).

Protected Area Designation	Managed by
Special Areas, including additional Wilderness Areas	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities

Monongahela Table 4. Subsections of the Monongahela National Forest, in order of prominence
"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percent of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF Acres divided by Monongahela total ownership, and these percents do add to 100, within rounding error. All values are approximate. See also Monongahela Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF in subsection
M221Ba—Northern High Allegheny Mountains	639,773	244,365	38	27
M221Bc—Southern High Allegheny Mountains	800,478	285,806	36	32
M221Bd—Eastern Allegheny Mountain and Valley	533,344	184,213	35	20
M221Bb—Western Allegheny Mountains	3,376,535	97,407	3	11
M221Be—West Allegheny Mountain and Valley	829,758	19,963	2	2.2
M221Cb—Eastern Coal Fields	1,573,158	19,297	1.2	2.1
M221Aa—Appalachian Ridges	5,660,394	51,807	1	6
Monongahela total ownership:		902,858		

Monongahela Table 5 [preliminary]. Subsections and alliances reported on Monongahela National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Monongahela Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) NH= Northern High Allegheny Mountains, SH= Southern High Allegheny Mountains, EA= Eastern Allegheny Mountain and Valley, WAM= Western Allegheny Mountains, WA= West Allegheny Mountain and Valley, ECF= Eastern Coal Fields, AR= Appalachian Ridges. For a list of alliances occurring in subsections of the Monongahela NF but not reported on NF land, see Monongahela Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

--Subsections of Monongahela NF--

Community Pattern **Alliances Reported on NF Land**	M221Ba (NH)		M221Bc (SH)		M221Bd (EA)		M221Bb *		M221Be *		M221Cb *		M221Aa *	
Matrix Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	•		•		•		•		•		•		•	
Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance	•		•		•		•		•		•		•	
Large Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance					•		▫		•		•		•	
Eastern Hemlock - Yellow Birch Forest Alliance	•		•		▫		•		▫		▫		•	
Eastern White Pine - Eastern Hemlock Forest Alliance	•		•		•		•		•		•		•	
Red Spruce - Balsam Fir Forest Alliance	•		•		▫		▫						•	
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	▫		▫		•		•		•		•		•	
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance	▫		▫		•		•		•		•		•	
Black Oak - White Oak Forest Alliance	•		•		•		•		•		•		•	
Red Oak - Sugar Maple - (White Oak) Forest Alliance	•		•		•		•		•		▫		•	
Sugar Maple - White Ash - American Basswood Forest Alliance	•		•		•		•		•		•		(1)	•
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	•		•		•		•		•		•		•	
Eastern Cottonwood Temporarily Flooded Forest Alliance					•		•		•		•		•	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance					•		•		▫		•		•	

*We were unable to obtain data about alliances on national forest land in these subsections. We were also unable to identify RNA-equivalents for M221Bb, M221Be, and M221Cb.

--Subsections of Monongahela NF--

Community Pattern **Alliances Reported on NF Land**	M221Ba (NH)	M221Bc (SH)	M221Bd (EA)	M221Bb *	M221Be *	M221Cb *	M221Aa *
Red Maple - Green Ash Seasonally Flooded Forest Alliance			▪	▪	▪	▪	▪
River Birch - (Sycamore) Temporarily Flooded Forest Alliance	▪		▪	▪	▪	▪	▪
Red spruce - Balsam Fir Saturated Forest Alliance	▪	▪		▪			▪

Small Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Peatmoss (Sphagnum recurvum) Saturated Nonvascular Alliance	(3)	▪					(3)	▪						
Red Maple Seasonally Flooded Woodland Alliance	▪						▪				▪		▪	
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance					▪		▪		▪		▪		▪	
Eastern Hemlock Saturated Forest Alliance	▪				▪		▪		▫		▫		▪	
Red Spruce Saturated Forest Alliance													(1)	▪
Black Ash - Red Maple Saturated Forest Alliance	▪						▪						▪	
Red Maple - Black Gum Saturated Forest Alliance	▪		▫				▪		▫		▪		▪	
Pitch Pine Saturated Woodland Alliance	▪						▪							
Red Spruce Saturated Woodland Alliance	▪		▪				▪						▪	
(Jack Pine, Red Pine) Woodland Alliance	▪										▫		▪	
Northern White-cedar Woodland Alliance					▪								▪	
Pitch Pine - Oak (Scarlet, Black) Woodland Alliance					▪						▪		▪	
Pitch Pine Woodland Alliance	▪				▫		▪						▪	
Red Spruce Woodland Alliance	▪												▪	
American Basswood - White Ash Woodland Alliance	▪						▪				▫		▪	
Black Willow Temporarily Flooded Shrubland Alliance	▫				▪		▪		▪		▪		▪	
Buttonbush Semipermanently Flooded Shrubland Alliance					▪		▪		▪		▪		▪	
River Birch Temporarily Flooded Shrubland Alliance	▪						▪		▪		▪		▪	
Leatherleaf / Wiregrass Sedge Saturated Shrub Herbaceous Alliance			▪											
(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) Dwarf-shrubland Alliance	▪						▪						▪	
Alpine Blueberry Dwarf-Shrubland Alliance	▪						▪						▪	
American Cranberry Saturated Dwarf-Shrubland Alliance	▪						▪						▪	

*We were unable to obtain data about alliances on national forest land in these subsections. We were also unable to identify RNA-equivalents for M221Bb, M221Be, and M221Cb.

Community Pattern **Alliances Reported on NF Land**	--Subsections of Monongahela NF-- M221Ba (NH)	M221Bc (SH)	M221Bd (EA)	M221Bb *	M221Be *	M221Cb *	M221Aa *
Huckleberry (Black, Dwarf) Saturated Dwarf-Shrubland Alliance	▪			▪			▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪
(Prickly Bog Sedge, Star Sedge) - Tawny Cottongrass - Northern Beaksedge - Roughleaf Goldenrod Saturated Herbaceous Alliance							▪(1)
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance	▪			▪			▪

*We were unable to obtain data about alliances on national forest land in these subsections. We were also unable to identify RNA-equivalents for M221Bb, M221Be, and M221Cb.

Monongahela Table 6. RNA-equivalents of the Monongahela National Forest
RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA. There are currently no established RNAs on the Monongahela.

Subsection	RNA-Equivalent (acres)		
	USFS Wilderness Areas (Monongahela)*	**West Virginia State Natural Areas**	**TNC Preserves in West Virginia**
M221Ba	· Fisher Spring Run Bog Wilderness · Red Creek Wilderness · Stone Coal Run Bog Wilderness		· Sapling Ridge
M221Bc			
M221Bd			
M221Bb			· Cranesville Swamp · Finzel Swamp · Hammel Glade · The Glades
M221Be			
M221Cb			
M221Aa	· Salt Pond Mountain Wilderness	· Johnson Creek State Natural Area Preserve · Pinnacle State Natural Area Preserve	· Oldtown Romney Shale Glade · Potts Creek Shale Barren · Slaty Mountain

*These areas are treated as RNA-equivalents in this preliminary assessment, but should be further evaluated.

Monongahela Table 7. Summary of subsection representation on the Monongahela National Forest
7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
M221Ba. Northern High Allegheny Mountains		4			*unknown*
M221Bc. Southern High Allegheny Mountains					*unknown*
M221Bd. Eastern Allegheny Mountain and Valley					*unknown*
M221Bb. Western Allegheny Mountains		4			*unknown*
M221Be. West Allegheny Mountain and Valley					*unknown*
M221Cb. Eastern Coal Fields					*unknown*
M221Aa. Appalachian Ridges		6			*unknown*
TOTAL	0	14			*unknown*

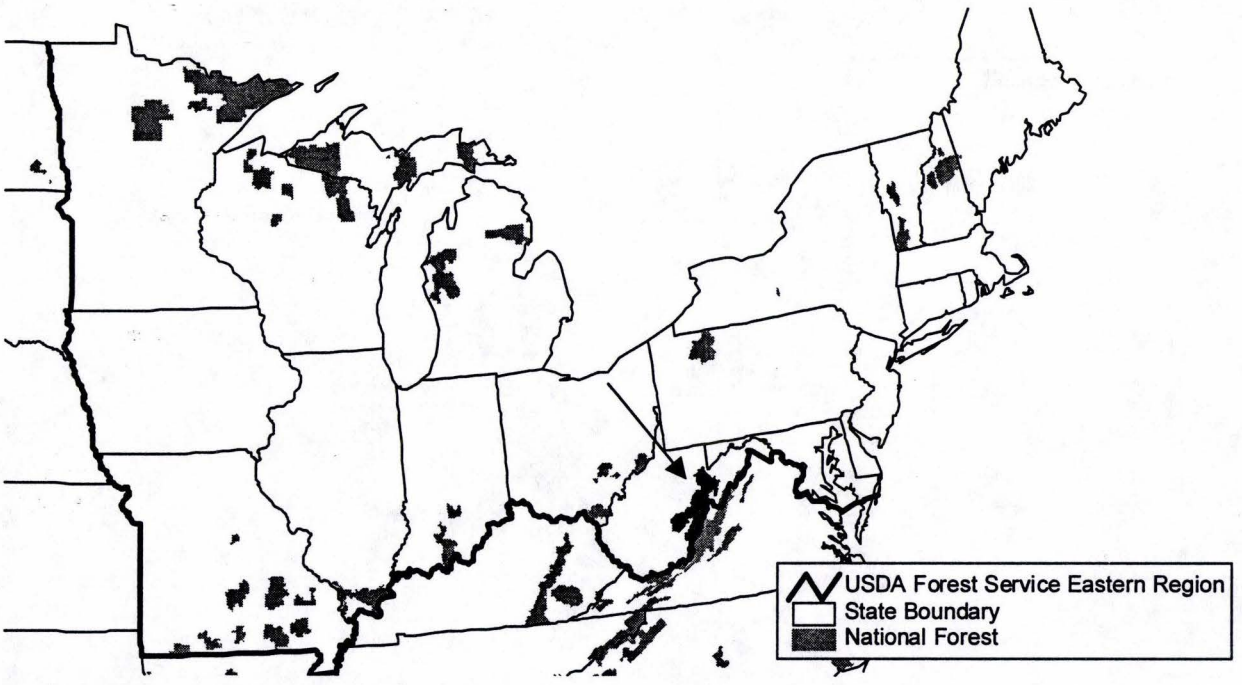
7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
M221Ba. Northern High Allegheny Mountains	29		1 *3%*	1	
M221Bc. Southern High Allegheny Mountains	13			0	
M221Bd. Eastern Allegheny Mountain and Valley	21			0	
M221Bb. Western Allegheny Mountains	*unknown*				
M221Be. West Allegheny Mountain and Valley	*unknown*				
M221Cb. Eastern Coal Fields	*unknown*				
M221Aa. Appalachian Ridges	2+*unknown*		1 *50%*	1 *50%*	1

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

MONONGAHELA FIGURES

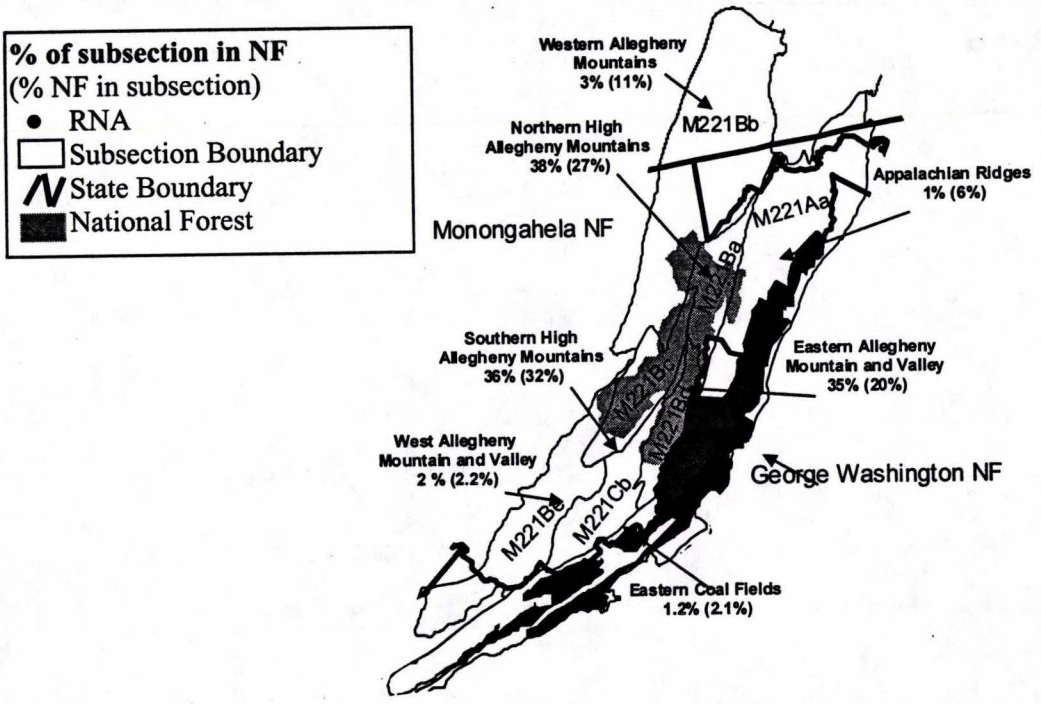
Monongahela Figure 1. Location of the Monongahela National Forest



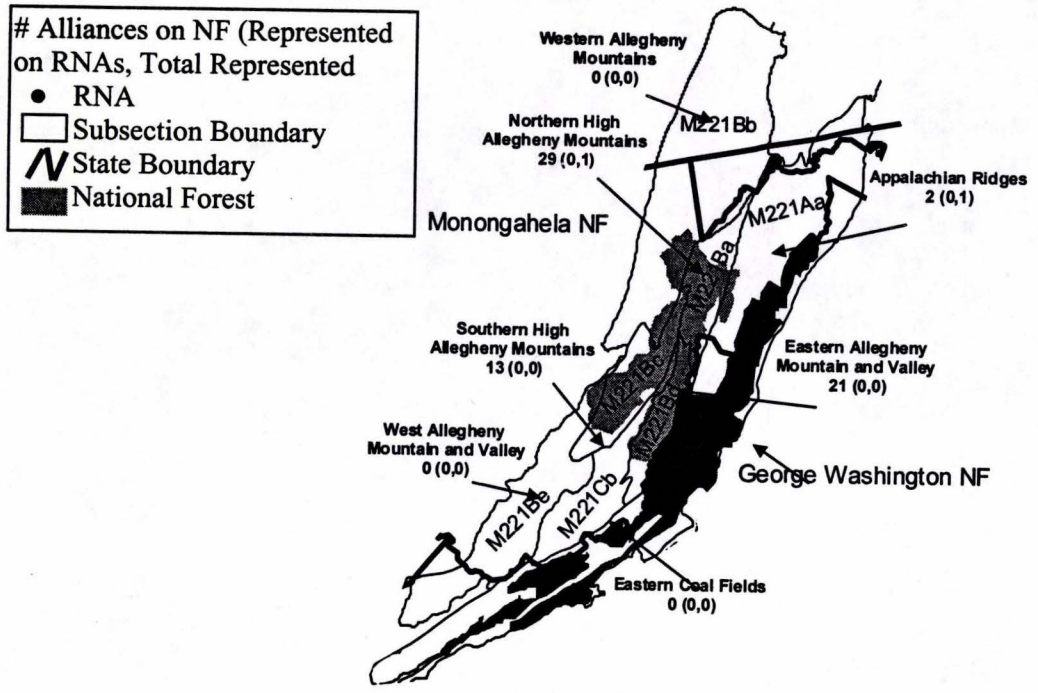
Monongahela Figure 2. The Monongahela National Forest with established RNAs.

There are no established RNAs on the Monongahela National Forest.

Monongahela Figure 3. Monongahela National Forest in relation to subsections.
National forests are shaded, but not all land in the shaded areas is managed by a national forest. In each subsection, the percent of the subsection *managed* by Monongahela National Forest (*prominence)* is shown, followed (in parentheses) by the percent of National Forest land (managed) in the subsection.



Monongahela Figure 4. Alliance representation on subsections of the Monongahela National Forest.
National forests are shaded, but not all land in the shaded areas is managed by a national forest. In each subsection is shown the number of alliances occurring on National Forest land, and in parentheses, the number of these represented by RNAs only followed by the total number represented.



MONONGAHELA APPENDICES

Monongahela Appendix A. Subsections of the Monongahela National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Monongahela Table 5 for information on the format of this table. The difference between these two tables is that Monongahela Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Monongahela Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

--Subsections of Monongahela NF--

Community Pattern **Alliances not Reported on NF Land**	M221Ba (NH)		M221Bc (SH)		M221Bd (EA)		M221Bb (WAM)		M221Be (WA)		M221Cb (ECF)		M221Aa (AR)	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Red Spruce - Yellow Birch Forest Alliance											▫			
Red Spruce Forest Alliance													▪	
American Beech - White Oak Forest Alliance									▫		▫			
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Great Rhododendron Saturated Shrubland Alliance													▪	
Lesser Rocktripe Nonvascular Alliance		▪											▪	
Smooth Alder Saturated Shrubland Alliance							▪							
(Pitch Pine, Table Mountain Pine) - (Rock Chestnut Oak, Scarlet Oak) Forest Alliance													▪	
Northern White Cedar Forest Alliance													▪	
Red Pine Forest Alliance		▪												
White Pine Forest Alliance					▫						▪		▪	
Sugar Maple - Chinquapin Oak Forest Alliance					▫		▫		▫		▫		▪	
Silver Maple Temporarily Flooded Forest Alliance													▪	
Sweetgum - (Red Maple) Seasonally Flooded Forest Alliance											▪			
Red Spruce - Red Maple Saturated Forest Alliance							▪						▪	
(Pitch Pine, Table Mountain Pine, Virginia Pine) - (Chestnut Oak, Scarlet Oak) Woodland Alliance	(1)	▪											(3)	▪
Red Cedar - (Green Ash, Eastern Hop-Hornbeam) Woodland Alliance					▫									▪
Red Pine - Red Oak Woodland Alliance														▪

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Monongahela NF-- M221Ba (NH)	M221Bc (SH)	M221Bd (EA)	M221Bb (WAM)	M221Be (WA)	M221Cb (ECF)	M221Aa (AR)
Chinquapin Oak Woodland Alliance							(1) ▪
Red Oak - Rock Chestnut Oak Woodland Alliance			▫				▪
White Oak - (Black Oak) Woodland Alliance							▫
Smooth Alder Temporarily Flooded Shrubland Alliance	▫	▫	▫	▫	▫	▫	▫
Highbush Blueberry Saturated Shrubland Alliance							▪
Mountain Oatgrass Herbaceous Alliance				▫			▪
Poverty Oatgrass Herbaceous Alliance	▪						
Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance			▫	▪	▫	▪	▪
Twisted Sedge Temporarily Flooded Herbaceous Alliance	▪						
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▫	▫	▫	▫	▫	▫	▫
Wire Rush Seasonally Flooded Herbaceous Alliance							▪
Alkali Bulrush Semipermanently Flooded Herbaceous Alliance							▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▫	▫	▫	▫	▫	▫	▫
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance	▫		▫		▫	▫	▫
Saltmarsh Bulrush Semipermanently Flooded Herbaceous Alliance							▪
Moss Phlox - Sticky Goldenrod Intermittently Flooded Herbaceous Alliance							▪
Golden-saxifrage Saturated Herbaceous Alliance	▫	▫	▫	▫	▫	▫	▫
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance	▫		▫				▫
American Eelgrass Permanently Flooded Herbaceous Alliance	▪						
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance	▫	▫	▫	▫	▫	▫	▫
Wall-rue - Purple Cliff-brake Sparsely Vegetated Alliance							▪

Monongahela Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Monongahela National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection* M221Ba. *Northern High Allegheny Mountains								
Small Patch Alliances								
Peatmoss (Sphagnum recurvum) Saturated Nonvascular Alliance		Fisher Spring Run Bog Wilderness	91	A	U	B	B*	
		Red Creek Wilderness	80	A	CD	B	B*	
		Stone Coal Run Bog Wilderness	180	A	U	B	B*	
(Pitch Pine, Table Mountain Pine, Virginia Pine) - (Chestnut Oak, Scarlet Oak) Woodland Alliance		Sapling Ridge	0	U	B	B	B	
Northern High Allegheny Mountains (M221Ba) Total:			351					
Subsection* M221Bc. *Southern High Allegheny Mountains								
Southern High Allegheny Mountains (M221Bc) Total:								
Subsection* M221Bd. *Eastern Allegheny Mountain and Valley								
Eastern Allegheny Mountain and Valley (M221Bd) Total:								
Subsection* M221Bb. *Western Allegheny Mountains								
Small Patch Alliances								
Peatmoss (Sphagnum recurvum) Saturated Nonvascular Alliance		Cranesville Swamp	560	A	Q	B	B*	
		Finzel Swamp		U	Q	B	U	
		Hammel Glade	300	A	A	B	A	
		The Glades	280	A	AB	B	AB	
Western Allegheny Mountains (M221Bb) Total:			1,140					
Subsection* M221Be. *West Allegheny Mountain and Valley								
West Allegheny Mountain and Valley (M221Be) Total:								
Subsection* M221Cb. *Eastern Coal Fields								
Eastern Coal Fields (M221Cb) Total:								
Subsection* M221Aa. *Appalachian Ridges								
Large Patch Alliances								
Sugar Maple - White Ash - American Basswood Forest Alliance		Pinnacle State Natural Area Preserve	0	U	B	B	B*	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Small Patch Alliances								
Red Spruce Saturated Forest Alliance		Salt Pond Mountain Wilderness	9	B	AB	B	B	
(Pitch Pine, Table Mountain Pine, Virginia Pine) - (Chestnut Oak, Scarlet Oak) Woodland Alliance		Johnson Creek State Natural Area Preserve	10	B	A	B	AB	
		Oldtown Romney Shale Glade		U	Q	B	U	
		Potts Creek Shale Barren	12	B	A	B	AB	
		Slaty Mountain		U	B	B	B	
Chinquapin Oak Woodland Alliance		Pinnacle State Natural Area Preserve	1	C	B	B	B	
(Prickly Bog Sedge, Star Sedge) - Tawny Cottongrass - Northern Beaksedge - Roughleaf Goldenrod Saturated Herbaceous Alliance		Salt Pond Mountain Wilderness		U	CD	B	C	
		Appalachian Ridges (M221Aa) Total:	32					
		Grand Total:	1,523					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

IX. J. Ottawa National Forest RNA Assessment

OTTAWA SUMMARY

This section summarizes the portions of the regional RNA assessment pertaining to the Ottawa National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Ottawa National Forest lands. The Ottawa National Forest occupies portions of 8 subsections. Five of these subsections are also occupied by the Chequamegon-Nicolet National Forest. The Ottawa shares with the Chequamegon-Nicolet and with other conservation partners the opportunity to represent the ecosystems found in these subsections.

Thirty-four alliances occur on Ottawa lands, with the number of alliances in each subsection ranging from 6 to 31. There are 184 alliance-subsection combinations on Ottawa lands; these are the ecosystems to represent for the Ottawa National Forest. Of these alliance-subsection combinations, 123 also occur and could be represented on the Chequamegon-Nicolet National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Six of the Ottawa alliance-subsection combinations (ecosystems) are represented by the 1 currently established Ottawa RNA; an additional 15 are represented by the 8 established Chequamegon-Nicolet RNAs located in 4 of the 8 subsections.

Existing **RNA-equivalents** in these subsections include:

- 5 Michigan Natural Areas,
- 43 Wisconsin State Natural Areas, and
- 8 preserves of The Nature Conservancy

These 56 RNA-equivalents, along with the 9 RNAs, currently represent 32 (17%) of the Ottawa alliance-subsection combinations (ecosystems). The number of represented ecosystems is possibly larger, as we were unable to confidently identify alliances for many RNA-equivalents. Resolving these questions could quickly reduce the number of unrepresented ecosystems.

UNREPRESENTED ECOSYSTEMS

The Ottawa has 152 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing RNAs on the Ottawa and Chequamegon-Nicolet National Forests, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Ottawa are:

- Ewen Dissected Lake Plain (212Jo)
- Gogebic-Penokee Iron Range (212Jb)
- Winegar Morianes (212Jc)

The Ottawa has high prominence (> 15%) in these subsections, and very little of the biological diversity (fewer than 25% of the alliances) is represented in each.

Medium-priority subsections are Brule and Paint Rivers–Drumlinized Ground Moraine (212Jl) and Keweenaw Moraines and Plains (212Jn). Ottawa prominence is greater than 4% in these subsections, and fewer than 25% of the alliances are represented in these subsections.

Low-priority subsections are Lake Superior Clay Plains (212Ja), Michigamme Highlands (212Jr), and Northern Highlands Pitted Outwash (212Jm), because Ottawa prominence is less than 4% in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented area of the landscape (matrix alliances), there are 11 **high-priority alliances** (of 34 Ottawa alliances). These may be high-priority in each subsection in which they occur. Four are not represented in *any* subsection in which they occur on Ottawa land:

- Jack Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Spruce - Balsam Fir Forest Alliance

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IX.J.1. INTRODUCTION

The Ottawa National Forest is located in the Upper Peninsula of Michigan (Ottawa Figure 1). The proclamation and purchase unit boundaries contain 1,569,708 acres; 988,784 acres (63%) of this land is currently (FY97) managed by the Ottawa National Forest.

The Chequamegon-Nicolet National Forest shares subsections with the Ottawa. The Nicolet portion of the Chequamegon-Nicolet National Forest is contiguous with the Ottawa along the Wisconsin border. Therefore the completion of a representative RNA network for the Ottawa is closely tied to the work of the Chequamegon-Nicolet National Forest.

The Ottawa National Forest occurs entirely in Province 212 (Laurentian Mixed Forest Province). Appendix VIII lists the other national forests in the Province. The Ottawa National Forest can work with the other national forests in this Province to evaluate province-wide representation and establish priorities for the Province.

IX.J.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Ottawa.

IX.J.2.a. Subsections

Jan Schultz, RNA Coordinator for the Hiawatha National Forest, provided us with subsections of the Ottawa National Forest. Her list agrees with an overlay of a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo) on the digital subsection map of Keys *et al.* (1995).

We used these digital maps to determine the amount of land in each subsection within Ottawa proclamation boundaries and purchase units. To estimate ownership acreage within each subsection, we multiplied these values by 63%, the fraction of ownership to proclamation acres for the entire Ottawa National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of Ottawa National Forest land (ownership) in each subsection, and the percent of each subsection with Ottawa National Forest land (ownership).

Ownership acreage by subsection for the Chequamegon-Nicolet National Forest was calculated using the same method. On the five subsections that the Ottawa shares with this Forest, we added the additional national forest acres to the Ottawa acres to calculate the percent of total national forest land in each subsection and the percent of each subsection with national forest land.

The percent of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service (or a particular national forest) in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence of Ottawa land in each subsection. If the Ottawa and Chequamegon-Nicolet work together towards broader conservation goals, then they may want to prioritize by prominence of total national forest land in each subsection.

The percent of national forest land in a subsection gives an indication of the dominance of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.J.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Michigan, we requested information from state Heritage and national forest ecologists. They provided additional information about the presence of these alliances on national forest land. Jan Schultz of the Hiawatha National Forest used the Forest Service timber databases (Combined Data System) to aid her work. (The alliances that occur on Forest Service lands are the focus of the RNA assessment.)

In January 1998, associations (one level below alliance) were assigned to each community occurrence recorded in the Michigan Natural Heritage Program database. We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land. These data provided us with additional alliances in some subsections; the alliance lists have not been reviewed since these additions.

Alliance distributions in the Wisconsin portions of subsections shared with Michigan came from the representative RNA pilot studies conducted in 1994 for the Chequamegon and Nicolet National Forests (see Section V.A.), additions by national forest and State Ecologists, and a final review by the State Ecologist. They were later supplemented by Element Occurrence data from the Wisconsin Heritage database.

IX.J.2.c. Identifying RNA-equivalents

RNA-equivalents in Michigan were identified in discussions of ecologists of the Ottawa, Hiawatha, and Huron-Manistee National Forests, Michigan Natural Features Inventory, and the authors. RNA-equivalents in Wisconsin were identified in discussions of ecologists of the Chequamegon-Nicolet National Forest, the Wisconsin Department of Natural Resources, and the authors. The RNA Committee of the Ottawa National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.J.2.d. Digitizing RNAs

The Ottawa National Forests provided a USGS 7.5 minute (1:24,000 scale) topographical map. We drew the RNA boundary onto the map using the establishment record as a guide. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of the Ottawa National Forest RNA (Ottawa Figure 2) in the projection used by the Ottawa National Forest (Michigan-North Stateplane 2111, NAD 27, feet), or a Lake States or Region-wide RNA cover at regional projections.

IX.J.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

We created a preliminary list of alliances for McCormick RNA using the SAF cover types provided in the Establishment Record. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. For these, we chose the alliance most likely to occur in that part of the geographic range of the cover type. Our choices were reviewed by Pat Comer, then of Michigan Natural Features Inventory, who is familiar with the site.

On the subsections it shares with the Ottawa, the Chequamegon-Nicolet has 8 established RNAs. The communities on these RNAs were identified as part of the 1994 Chequamegon and Nicolet pilot studies. We revised these data to update the alliances to reflect recent changes to the classification and to incorporate some information from the RNA Establishment Records.

Kim Herman of the Michigan Natural Features Inventory provided us with a list of Michigan Natural Areas, with total acreage and subsection for each area. We were unable to obtain community information, except for the few sites with Element Occurrences (EOs) recorded in the Michigan Heritage database. In these cases the acres assigned to the type are the size of the EO, which may not be entirely contained by the Natural Area.

Wisconsin Natural Heritage Program provided us with lists of communities for most Wisconsin Scientific Areas, which had been obtained through recent site surveys. The translation between the Wisconsin Heritage Program community types and alliances is not clean—many Heritage types correspond to multiple alliances—so there is low confidence for many of these assignments. Additional information for some sites came from the Wisconsin Heritage Program Element Occurrence database.

Complete community information for Michigan TNC preserves was provided by Doug Pearsall of the Michigan Field Office of The Nature Conservancy.

Nancy Braker and Jude McCall of the Wisconsin Field Office provided us with a list of Wisconsin TNC preserves and subsections, and a list of communities for 2 of these preserves. The communities were provided in the Wisconsin Heritage classification, so there are the same translation problems as for Wisconsin State Natural Areas. As no acreages were provided for these community occurrences, we could not rank them and therefore do not know if they represent the corresponding alliances. The occurrences are listed in Ottawa Appendix B but do not appear in any other tables.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Ottawa Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Ottawa National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.J.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Ottawa National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.J.3.a. Subsections on national forest land

The 8 subsections that occur on Ottawa National Forest land are listed below (see also Ottawa Table 4). These subsections are listed in order of *prominence*, the percent of the subsection on Hiawatha National Forest land.

- Ewen Dissected Lake Plain (212Jo)
- Gogebic-Penokee Iron Range (212Jb)*
- Winegar Moraines (212Jc)*
- Brule and Paint Rivers-Drumlinized Ground Moraine (212Jl)*
- Keweenaw Moraines and Plains (212Jn)
- Lake Superior Clay Plain (212Ja)*
- Michigamme Highlands (212Jr)
- Northern Highlands Pitted Outwash (212Jm)*

*The Chequamegon-Nicolet National Forest also occurs on 5 of these subsections: 212Jb, 212Jc, 212Jl, 212Ja, and 212Jm. The Ottawa National Forest can work with the Chequamegon-Nicolet to represent the range of natural communities in each of these subsections.

Most of the Ottawa National Forest land occurs on subsections 212Jc (43%) and 212Jb (24%; Ottawa Table 4). Another 23% of the National Forest is occupied by 2 other subsections: 212Jo (12%) and 212Jl (11%). Significant portions of three of these subsections, 212Jc (15%), 212Jb (24%), and 212Jo(36%), are managed by the Ottawa National Forest, *i.e.*, the Ottawa has high *prominence* of land coverage in these subsections. It manages less than 10% of the remaining 5 subsections that occur in the Ottawa.

Large portions of subsections 212Jc and 212Jl also occur on the Chequamegon-Nicolet National Forest. When those lands are included, 30% of 212Jc and 43% of 212Jl are managed by national forests (Ottawa Table 4). Chequamegon-Nicolet also manages a small portion of 212Jb (4%), but Ottawa has a much greater opportunity for land protection in this subsection. Subsections 212Ja and 212Jm occur in both Ottawa and Chequamegon-Nicolet, but less than 5% of each subsection is managed by either national forest. Each subsection makes up 5% or less of Ottawa National Forest land.

The 2 remaining subsections (212Jn and 212Jr) each occupy less than 5% of Ottawa National Forest (Ottawa Table 4), and less than 5% of each is managed by Ottawa. These subsections contain no other national forest land.

IX.J.3.b. Natural communities within subsections

A total of 79 alliances are reported to occur within these 8 subsections. Of these, 56 are known to be on national forest land (Ottawa Table 5, first column); the 17 alliances not reported to occur on national forest land are listed in Ottawa Appendix A. Twenty-two of the "national forest alliances" have only been reported for the Chequamegon-Nicolet National Forest (Ottawa Appendix D). While these 22 alliances are not considered to be ecosystems to represent for the Ottawa in this assessment, they should be checked for presence on Ottawa land.

Of the 56 alliances occurring on national forest land, 13 are **matrix** alliances (see Ottawa Table 5, first set of alliances), 25 are **large patch** (second set) and 18 are **small patch** (third set). (See "National Vegetation Classification," pp. 8-9.) Of the 34 alliances reported on Ottawa land, 11 are matrix, 15 are large patch, and 8 are small patch.

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on *Ottawa* National Forest land within each subsection:

- 212Jo (Ewen Dissected Lake Plain): 25 alliances (8 matrix, 12 large patch, 5 small patch)
- 212Jb (Gogebic-Penokee Iron Range): 23 alliances (10 matrix, 8 large patch, 5 small patch)
  (An additional 1 matrix, 11 large patch, and 5 small patch are reported for the Chequamegon-Nicolet in this subsection.)
- 212Jc (Winegar Moraines): 25 alliances (11 matrix, 12 large patch, 4 small patch)
  (An additional 2 matrix, 8 large patch, and 3 small patch are reported for the Chequamegon-Nicolet in this subsection.)
- 212Jl (Brule and Paint Rivers): 31 alliances (11 matrix, 15 large patch, 5 small patch)
  (An additional 6 large patch and 8 small patch are reported for the Chequamegon-Nicolet in this subsection.)
- 212Jn (Keweenaw Moraines and Plains): 29 alliances (11 matrix, 12 large patch, 6 small patch)
- 212Ja (Lake Superior Clay Plain): 17 alliances (7 matrix, 7 large patch, 3 small patch)
  (An additional 2 matrix, 2 large patch, and 1 small patch are reported for the Chequamegon-Nicolet in this subsection.)
- 212Jr (Michigamme Highlands): 6 alliances (3 matrix, 3 large patch, 0 small patch)
- 212Jm (North. Highlands Pitted Outwash): 21 alliances (10 matrix, 8 large patch, 3 small patch)
  (An additional 1 matrix, 7 large patch, and 4 small patch are reported for the Chequamegon-Nicolet in this subsection.)

Ottawa Table 5 shows the alliances that occur in each subsection. It identifies those on national forest land, but does not distinguish between the Ottawa and the Chequamegon-Nicolet when both National Forests share a common subsection. Alliances found only in the Chequamegon-Nicolet are listed in Ottawa Appendix D.

IX.J.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents. The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs (including the 8 on the Chequamegon-Nicolet) and all RNA-equivalents in each subsection are shown in the appropriate cells of Ottawa Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Ottawa Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

The Ottawa National Forest has 1 established RNA (Ottawa Table 6). Six Chequamegon-Nicolet RNAs can contribute to the representative network for the Ottawa, because they occur in shared subsections. The Ottawa currently has 2 candidate RNAs (cRNAs), and in shared subsections there are 4 cRNAs on Chequamegon-Nicolet land. Candidate RNAs are not included in the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs of the Ottawa National Forest (Ottawa Figure 2) is available in the projection used by the Ottawa National Forest (Michigan Stateplane Fipszone 2111 feet, NAD 27) from the Regional RNA Coordinator. A Lake States national forests RNA cover is also available.

RNA-equivalents

Some subsections of the Ottawa National Forest occur in both Michigan and Wisconsin. Therefore RNA-equivalents in both states are relevant. Ottawa, Hiawatha, Huron-Manistee National Forest and Michigan Natural Features Inventory personnel have agreed that the following areas are RNA-equivalents (Ottawa Table 2) in Michigan:

- Michigan Natural Areas (SNAs) on state-owned land that are documented and secure, and
- all of The Nature Conservancy's (TNC's) preserves.

Chequamegon-Nicolet National Forest, Wisconsin Department of Natural Resources, and The Nature Conservancy personnel have agreed that the following areas are RNA-equivalents (Ottawa Table 2) in Wisconsin:

- Wisconsin State Natural Areas (SNAs) and
- all of The Nature Conservancy's (TNC's) preserves.

Additional designations can potentially serve as RNA-equivalents, but have not yet been evaluated (Ottawa Table 3, Ottawa Appendix E). Certain portions of Wisconsin State Forests and Parks *may* meet the criteria for RNA-equivalency (Ottawa Table 3). Ottawa National Forest personnel can work with conservation partners to evaluate these potential RNA-equivalents and find additional RNA-equivalents.

In Michigan, at present, no portions of State Forests, State Parks, State Wayside, or Wildlife Management Areas are RNA-equivalents. In Wisconsin no portions of State Wayside or Wildlife Management Areas are RNA-equivalents. If the legal protection status (including management directives) of these areas is increased, then they could be reconsidered for RNA-equivalency.

Twenty Wisconsin State Natural Areas, 5 Michigan Natural Areas, 5 Wisconsin TNC preserves, and 2 Michigan TNC preserves serve as RNA-equivalents for the Ottawa National Forest (Ottawa Table 7a).

We were unable to obtain community data for some RNA-equivalents, and for others our data are incomplete. As a result there is likely to be a higher number of represented ecosystems than indicated below.

Subsection 212Jo (Ewen Dissected Lake Plain)

This subsection contains no RNAs or RNA-equivalents (Ottawa Figure 3, Ottawa Tables 6, 7a). Thus, the 8 matrix, 12 large patch, and 5 small patch alliances in the subsection are unrepresented (Ottawa Table 7b).

Subsection 212Jb (Gogebic-Penokee Iron Range)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

The Chequamegon-Nicolet contains 1 RNA within this subsection, covering 80 acres (Ottawa Figure 3, Ottawa Tables 6, 7a):

- Chequamegon Hardwoods

This subsection also contains 1 Michigan Natural Area, covering 1 acre (Ottawa Tables 6, 7a):

- Fort Wilkins State Park Site*

Thus, 81 acres, (0.008%) of the subsection are protected by RNAs and RNA-equivalents (Ottawa Table 7a).

Natural Communities (Alliances)

Of 40 alliances reported to be on national forest land in Subsection 212Jb, 1 is represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Ottawa Table 5, column 212Jb; Ottawa Table 7b; Ottawa Figure 4). Additional alliances may be represented on the Michigan Natural Area, for which we do not have community data.

Sixteen unrepresented alliances were reported to occur only within the Chequamegon-Nicolet National Forest in this subsection (Ottawa Appendix D). Unless it is determined that these alliances do occur on Ottawa land in 212Jb, they are not ecosystems to represent for the Ottawa in this subsection.

This leaves 24 alliances to be represented on the Ottawa in this subsection. Of 10 **matrix** alliances, 1 is represented. None of the 9 **large patch** or 5 **small patch** alliances are represented.

One of the unrepresented large patches has a low-quality occurrence on a RNA due to its small size:

- Black Ash - Red Maple Saturated Forest Alliance (Chequamegon Hardwoods)

Subsection 212Jc (Winegar Moraines)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

The Chequamegon-Nicolet contains 2 RNAs within this subsection, covering 457 acres (Ottawa Figure 3, Ottawa Tables 6, 7a):

- McCarthy Lake and Cedars (363 acres)
- Spider Lake (94 acres)

This subsection also contains four Wisconsin SNAs (Ottawa Tables 6, 7a):

- Dunn Lake

- Mary Lake
- Moose Lake Hemlocks (40 acres)
- Totagatic Highlands Hemlocks,

two preserves of The Nature Conservancy in Wisconsin, (Ottawa Tables 6, 7a):

- Crab Lake Preserve (130 acres)*
- Flambeau Pines and Boreal Forest (220 acres)*,

and one preserve of The Nature Conservancy in Michigan, (Ottawa Tables 6, 7a):

- Squaw Lake (67 acres).

The 457 acres of RNA-equivalent land shown in Ottawa Table 7a is an underestimate because the size of 3 of the Wisconsin SNAs was not known. Using the underestimated figure, 914 acres (0.03%) of the subsection are protected by RNAs and RNA-equivalents (Ottawa Table 7a).

Natural Communities (Alliances)

Of 39 alliances reported to be on national forest land in Subsection 212Jc, 9 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Ottawa Table 5, column 212Jc; Ottawa Table 7b; Ottawa Figure 4). Additional alliances may be represented on the 2 Wisconsin TNC preserves without community data.

Three represented alliances and 8 unrepresented alliances were reported to occur only within the Chequamegon-Nicolet National Forest in this subsection (Ottawa Appendix D). Unless it is determined that these alliances do occur on Ottawa land in 212Jc, they are not ecosystem to represent for the Ottawa in this subsection.

This leaves 28 alliances to be represented on the Ottawa in this subsection. Of 11 **matrix** alliances, 2 are represented. Four of the 13 **large patch**, and none of the 4 **small patch** alliances are represented.

Two of the unrepresented matrix alliances and 1 one the unrepresented large patch alliances have low-quality occurrences due to their small sizes:

- Sugar Maple - Yellow Birch- (American Beech) Forest Alliance (Squaw Lake, McCarthy Lake & Cedars)
- Quaking Aspen - Paper Birch Forest Alliance (McCarthy Lake & Cedars)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (McCarthy Lake & Cedars)

Subsection 212Jl (Brule and Paint Rivers-Drumlinized Ground Moraine)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

The Chequamegon-Nicolet contains 3 RNAs within this subsection, covering 1,100 acres (Ottawa Figure 3, Ottawa Tables 6, 7a):

- Bose Lake (81 acres)
- Grandma Lake Wetlands (495 acres)
- McCaslin Mountain (524 acres)

This subsection also contains 9 Wisconsin SNAs (Ottawa Tables 6, 7a):

- Atkins Lake
- Bastille Lake*
- Brule River Cliffs*
- Fox Maple Woods
- Giant White Pine Grove (235 acres)

* No community data available at this time.

- Glocke Lake
- Scott Lake-Shelp Lake Natural Area (272 acres)*
- Snow Falls Creek*
- Wisconsin Slough*

The 507 acres of RNA-equivalent land shown in Ottawa Table 7a is an underestimate because the size of 7 of the Wisconsin SNAs was not known. Using the underestimated figure, 1,607 acres (0.1%) of the subsection are protected by RNAs and RNA-equivalents (Ottawa Table 7a).

Natural Communities (Alliances)

Of 45 alliances reported to be on national forest land in Subsection 212Jl, 8 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Ottawa Table 5, column 212Jl; Ottawa Table 7b; Ottawa Figure 4). Additional alliances may be represented on the 5 Wisconsin SNAs without community data.

One of the represented alliances and 13 unrepresented alliances were reported to occur only within the Chequamegon-Nicolet National Forest in this subsection (Ottawa Appendix D). Unless it is determined that these alliances do occur on Ottawa land in 212Jl, they are not ecosystem to represent for the Ottawa in this subsection.

This leaves 31 alliances to be represented on the Ottawa in this subsection. Of 11 **matrix** alliances, 3 are represented. Four of the 15 **large patch**, and none of the 5 **small patch** alliances are represented.

Two of the unrepresented matrix patches have low-quality occurrences due to their small sizes:

- Eastern White Pine - Eastern Hemlock Forest Alliance (Giant White Pine Grove)
- White Spruce - Balsam Fir - Aspen Forest Alliance (Grandma Lake Wetlands)

Subsection 212Jn (Keweenaw Moraines and Plains)

This subsection contains no RNAs, but does contain one preserve of The Nature Conservancy (Ottawa Tables 6, 7a):

- Horseshoe Harbor

The 758 acres of RNA-equivalent land constitute 0.12% of the entire subsection.

Natural Communities (Alliances)

Of 30 alliances reported to be on national forest land in Subsection 212Jn, 1 is represented by a high-quality (A- or B-ranked) occurrence (Ottawa Table 5, column 212Jl; Ottawa Table 7b; Ottawa Figure 4). This alliance is 1 of 11 **matrix** alliances. None of the 13 **large patch** or 6 **small patch** alliances are represented.

One of the unrepresented matrix alliances and 3 of the unrepresented large patch alliances have low-quality occurrences on the TNC preserve due to their small sizes:

- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Northern White Cedar Forest Alliance
- Northern White Cedar Saturated Forest Alliance
- Speckled Alder Seasonally Flooded Shrubland Alliance

Subsection 212Ja (Lake Superior Clay Plain)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

* No community data available at this time.

This subsection contains no RNAs, but does contain 7 Wisconsin SNAs (Ottawa Tables 6, 7a):

- Bark Bay Slough (113 acres)
- Bibon Swamp
- Big Bay Sand Pit and Bog
- Dwight's Point and Pokegama Wetlands*
- Lost Creek Bog
- Port Wing Boreal Forest
- Sajdak Springs,

3 Michigan Natural Areas (Ottawa Tables 6, 7a):

- Porcupine Mountains (47,671 acres)*
- Presque Isle River Scenic Site (1,465 acres)*
- Union Springs Scenic Site (160 acres)*

and 3 preserves of The Nature Conservancy in Wisconsin (Ottawa Tables 6, 7a):

- Chequamegon Point (40 acres)*
- Kakegon Sloughs (81 acres)
- Squaw Bay (12 acres)*

The 49,542 acres of RNA-equivalent land shown in Ottawa Table 7a is an underestimate because the size of 6 of the Wisconsin SNAs was not known. Using the underestimated figure, 4% of the subsection is protected by RNA-equivalents (Ottawa Table 7a).

Natural Communities (Alliances)

Of 22 alliances reported to be on national forest land in Subsection 212Ja, 2 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Ottawa Table 5, column 212Ja; Ottawa Table 7b; Ottawa Figure 4). Additional alliances may be represented on the 1 Wisconsin SNA, 3 Michigan Natural Areas, and 2 TNC preserves without community data.

Four unrepresented alliances were reported to occur only within the Chequamegon-Nicolet National Forest in this subsection (Ottawa Appendix D). Unless it is determined that these alliances do occur on Ottawa land in 212Ja, they are not ecosystem to represent for the Ottawa in this subsection.

This leaves 18 alliances to be represented on the Ottawa in this subsection. Of 7 **matrix** alliances and 8 **large patch** alliances, 1 of each is represented. None of the 3 **small patch** alliances are represented.

Subsection 212Jr (Michigamme Highlands)

There is 1 RNA within this subsection, covering 3,675 acres (Ottawa Figure 3, Ottawa Tables 6, 7a):

- McCormick

This subsection also contains 1 Michigan Natural Area, covering 240 acres (Ottawa Table 6, 7a):

- Rocking Chair Lakes*

Thus, 3,915 acres (0.5%) of the subsection are protected by RNAs and RNA-equivalents (Ottawa Table 7a).

Natural Communities (Alliances)

All 6 alliances reported to be on national forest land in Subsection 212Jr are represented by high-quality (A- or B-ranked) occurrences on McCormick RNA (Ottawa Table 5, column 212Jr; Ottawa Table 7b; Ottawa Figure 4). These occurrences include 3 **matrix** alliances and 3 **large patch** alliances. No **small patch** alliances have been reported on national forest land in this subsection.

* No community data available at this time.

Subsection 212Jm (Northern Highlands Pitted Outwash)

This subsection is shared with the Chequamegon-Nicolet National Forest. The 2 Forests can work together to represent shared alliance-subsection combinations.

The Chequamegon-Nicolet contains 2 RNAs within this subsection, covering 222 acres (Ottawa Figure 3, Ottawa Tables 6, 7a):

- Memorial Grove Hemlocks (64 acres)
- Tucker Lake Hemlocks (158 acres)

This subsection also contains 23 Wisconsin SNAs and 1 TNC preserve (Ottawa Figure 3, Ottawa Tables 6, 7a):

- Aurora Lake (250 acres)
- Bass Lake Preserve
- Bittersweet Lakes (498 acres)
- Black Tern Bog (26 acres)
- Day Lake
- Escanaba Lake Hemlocks (130 acres)
- Finnerud Pine Forest (120 acres)
- Frog Lake and Pines
- Goodyear Springs-East
- High Lake Spruce-Balsam Forest (40 acres)
- Holmboe Conifer Forest (32 acres)
- Johnson Lake Barrens (105 acres)
- Moose Lake
- Patterson Hemlocks
- Pine-Oak Grove*
- Plum Lake Hemlock Forest (200 acres)
- Rice Lake-Thunder Lake Marsh (250 acres)
- Squirrel River Pines
- Stone Lake Pines
- Tomahawk River Pines
- Trout Lake Conifer Swamp (25 acres)
- Turtle-Flambeau Flowage*
- Wind Pudding Lake
- Clifford F. Messinger Bass Lake Preserve (TNC; 570 acres)*

The 2,246 acres of RNA-equivalent land area shown in Ottawa Table 7a is an underestimate, because acreage information was unavailable for 12 of the Wisconsin SNAs. Nevertheless, using this figure, 2,468 acres (0.2%) of the subsection are protected by RNAs and RNA-equivalents (Ottawa Table 7a).

Natural communities (alliances)

Of the 33 alliances reported to be on national forest land in Subsection 212Jm, 12 are currently represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Ottawa Table 5, column 212Jm; Ottawa Table 7b; Ottawa Figure 4). Additional alliances may be represented on the 2 Wisconsin SNAs and 1 TNC preserve without community data.

Three represented alliances and 8 unrepresented alliances were reported to occur only within the Chequamegon-Nicolet National Forest in this subsection (Ottawa Appendix D). Unless it is determined that these alliances do occur on Ottawa land in 212Jm, they are not ecosystem to represent for the Ottawa in this subsection.

This leaves 22 alliances to be represented on the Ottawa in this subsection. Of 10 **matrix** alliances, 5 are represented, and of 9 **large patch** alliances, 4 are represented. None of the 3 **small patch** alliances are represented.

Two of the unrepresented matrix alliances and 2 of the unrepresented large patch alliances have low-quality occurrences due to their small sizes:

- Eastern White Pine - Eastern Hemlock Forest Alliance (Holmboe Conifer Forest)
- Sugar Maple - Yellow Birch- (American Beech) Forest Alliance (Tucker Lake Hemlocks)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (Holmboe Conifer Forest, Trout Lake Conifer Swamp)
- Northern White Cedar Saturated Forest Alliance (poor condition; Trout Lake Conifer Swamp)

* No community data available at this time.

IX.J.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Ottawa National Forest. The suggested priority ranking of subsections (last column) is based on both **prominence** (the percentage of the subsection that is on national forest lands, 4th column) and **current representation of biological variation** (the percentage of alliances represented, 5th column). **Dominance** of the subsection (the percentage of national forest land that is in each subsection, 2nd column), and **percentage of subsection land area represented** (3rd column) were not used here to prioritize the subsections, although the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Ottawa Table 5 by shaded cells which contain no number. Alliances that are not represented in any Ottawa subsection (unrepresented Forest-wide) are listed in Ottawa Appendix C.

Subsection	Dominance Percentage of Ottawa NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Ottawa NF land	Percentage of NF alliances represented	Proposed priority
212Jo. Ewen Dissected Lake Plain	12	0	39	0	high
212Jb. Gogebic-Penokee Iron Range	24	0.008	24 (28*)	4 (3*)	high
212Jc. Winegar Moraines	43	0.03	15 (30*)	21 (23*)	high
212Jl. Brule & Paint Rivers-Drumlinized Ground Moraine	11	0.1	7.3 (43*)	23 (18*)	med.
212Jn. Keweenaw Moraines & Plains	3	0.12	4.6	3.3	med.
212Ja. Lake Superior Clay Plain	5	4	3.9 (5*)	11 (9*)	low
212Jm. North. Highlands Pitted Outwash	1	0.2	0.8 (3*)	41 (36*)	low
212Jr. Michigamme Highlands	2	0.5	2	100	low

* Value when Chequamegon-Nicolet lands and alliances are included.

Subsections 212Jo and 212Jb have the greatest prominence of all subsections on the Ottawa National Forest, and few of their alliances are currently represented, making them the highest priorities for future RNA establishment. With lower prominence and greater current representation, Subsection 212Jc has lower priority, but even so, 15% of the subsection is in the Ottawa and less than a quarter of the alliances are represented. With only 7.3% prominence, Subsection 212Jl is categorized as medium priority. Subsection 212Jn has even lower prominence, but with only 3.3% of its alliances represented, it is also categorized as medium. The remaining subsections have varying proportions of representation, but all have very low prominence, making them low priority.

With one exception, this order of priority follows the order of prominence. With 100% representation, Subsection 212Jr falls below 212Jm despite somewhat higher prominence. The RNA committees of Ottawa and Chequamegon-Nicolet can collaborate to increase representation in Subsections 212Jb, 212Jc (high priority) and 212Jl (medium priority). In terms of land area, the "low" priority subsections (212Ja, 212Jm, and 212Jr) are of marginal prominence, but they should be evaluated for special land type or other ecological features before deciding if little or no representation should occur.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

Subsection 212Jo (Ewen Dissected Lake Plain)

None of the 25 alliances are represented (Ottawa Figure 4).

Within the subsection, the 8 matrix types may be first priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Jb (Gogebic-Penokee Iron Range)

Of 24 alliances, 1 is represented, leaving 23 alliances (96%) in need of representation (Ottawa Figure 4).

Within the subsection, the 9 unrepresented matrix types may be first priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Michigan Natural Area, for which we currently have no community data:

- Fort Wilkins State Park Site

The Ottawa has the possibility of collaborating with the Chequamegon-Nicolet National Forest, with which it shares this subsection. It is not necessary for both Forests to represent the same ecosystem. The 16 alliances reported on only Chequamegon-Nicolet National Forest land in this subsection (Ottawa Appendix D) should be checked for presence on Ottawa land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Jc (Winegar Moraines)

Of 28 alliances, 6 are represented, leaving 22 alliances (79%) in need of representation (Ottawa Figure 4).

Within the subsection, the 9 unrepresented matrix types may be first priority for RNA establishment:

- Jack Pine Forest
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance

- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance* (Squaw Lake, McCarthy Lake & Cedars)
- Quaking Aspen - Paper Birch Forest Alliance* (McCarthy Lake & Cedars)

The 2 marked (*) alliances have low quality occurrences on RNA or RNA-equivalent land (Ottawa Table 7b, Ottawa Appendix B). The quality/viability of these occurrences should be verified.

Some ecosystems may be represented if high-quality alliances are identified on the following Wisconsin TNC preserves, for which we currently have no community data:

- Crab Lake Preserve
- Flambeau Pines and Boreal Forest

The Ottawa has the possibility of collaborating with the Chequamegon-Nicolet National Forest, with which it shares this subsection. It is not necessary for both Forests to represent the same ecosystem. The 16 alliances reported on only Chequamegon-Nicolet National Forest land in this subsection (Ottawa Appendix D) should be checked for presence on Ottawa land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Jl (Brule and Paint Rivers-Drumlinized Ground Moraines)

Of 31 alliances, 7 are represented, leaving 24 alliances (71%) in need of representation (Ottawa Figure 4).

Within the subsection, the 8 unrepresented matrix types may be first priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Jack Pine Forest
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance* (Giant White Pine Grove)
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance* (Grandma Lake Wetlands)
- White Spruce - Balsam Fir Forest Alliance

The 2 marked (*) alliances have low quality occurrences on RNA or RNA-equivalent land (Ottawa Table 7b, Ottawa Appendix B). The quality/viability of these occurrences should be verified.

Some ecosystems may be represented if high-quality alliances are identified on the following Wisconsin SNAs, for which we currently have no community data:

- Bastille Lake
- Brule River Cliffs
- Scott Lake-Shelp Lake
- Snow Falls Creek
- Wisconsin Slough

The Ottawa has the possibility of collaborating with the Chequamegon-Nicolet National Forest, with which it shares this subsection. It is not necessary for both Forests to represent the same ecosystem. The 14 alliances reported on only Chequamegon-Nicolet National Forest land in this subsection (Ottawa Appendix D) should be checked for presence on Ottawa land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Jn (Keweenaw Moraines and Plains)

Of 30 alliances, 1 is represented, leaving 29 alliances (97%) in need of representation (Ottawa Figure 4).

Within the subsection, the 10 unrepresented matrix types may be first priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- Jack Pine Forest
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- White Spruce - Balsam Fir Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance* (Horseshoe Harbor)

The marked (*) alliance has a low quality occurrence on RNA-equivalent land (Ottawa Table 7b, Ottawa Appendix B). The quality/viability of this occurrence should be verified.

Subsection 212Ja (Lake Superior Clay Plain)

Of 18 alliances, 2 are represented, leaving 16 alliances (89%) in need of representation (Ottawa Figure 4).

Within the subsection, the 6 unrepresented matrix types may be first priority for RNA establishment:

- Eastern Hemlock - Yellow Birch Forest Alliance
- Eastern Hemlock Forest Alliance
- Red Pine Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Some ecosystems may be represented if high-quality alliances are identified on the following Wisconsin SNA:

- Dwight's Point & Pokegama Wetlands,

Michigan Natural Areas:

- Porcupine Mountains
- Presque Isle River Scenic Site
- Union Springs Scenic Site,

and Wisconsin TNC preserves:

- Chequamegon Point
- Squaw Bay.

The Ottawa has the possibility of collaborating with the Chequamegon-Nicolet National Forest, with which it shares this subsection. It is not necessary for both Forests to represent the same ecosystem. The 4 alliances reported on only Chequamegon-Nicolet National Forest land in this subsection (Ottawa Appendix D) should be checked for presence on Ottawa land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Jm (Northern Highlands Pitted Outwash)

Of 22 alliances, 9 are represented, leaving 13 alliances (59%) in need of representation (Ottawa Figure 4).

Within the subsection, the 5 unrepresented matrix types may be first priority for RNA establishment:

- Jack Pine Forest
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- Eastern White Pine - Eastern Hemlock Forest Alliance* (Holmboe Conifer Forest)
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch- (American Beech) Forest Alliance* (Tucker Lake Hemlocks)

The 2 marked (*) alliances have low quality occurrences on RNA or RNA-equivalent land (Ottawa Table 7b, Ottawa Appendix B). The quality/viability of these occurrences should be verified.

Some ecosystems may be represented if high-quality alliances are identified on the following Wisconsin SNAs:

- Pine Oak Grove
- Turtle-Flambeau Flowage

and TNC preserve:

- Clifford F. Messinger Bass Lake Preserve.

The Ottawa has the possibility of collaborating with the Chequamegon-Nicolet National Forest, with which it shares this subsection. It is not necessary for both Forests to represent the same ecosystem. The 11 alliances reported on only Chequamegon-Nicolet National Forest land in this subsection (Ottawa Appendix D) should be checked for presence on Ottawa land to verify that they are indeed restricted to the Chequamegon-Nicolet.

Subsection 212Jr (Michigamme Highlands)

All 6 alliances are represented (Ottawa Figure 4). It is possible that additional alliances will be found to occur on national forest land in this subsection.

OTTAWA TABLES

Ottawa Table 1. Established research natural areas (RNAs) of subsections of the Ottawa National Forest

RNA	Acres	Subsection	Established	National Forest
Bose Lake	81	212Jl	1992	Chequamegon-Nicolet
Chequamegon Hardwoods	80	212Jb	1988	Chequamegon-Nicolet
Grandma Lake Wetlands	495	212Jl	1991	Chequamegon-Nicolet
McCarthy Lake & Cedars	363	212Jc	1989	Chequamegon-Nicolet
McCaslin Mountain	524	212Jl	1992	Chequamegon-Nicolet
Memorial Grove	64	212Jm	1989	Chequamegon-Nicolet
McCormick	3,675	212Jr	1971	Ottawa
Spider Lake	94	212Jc	1989	Chequamegon-Nicolet
Tucker Lake Hemlocks	158	212Jm	1991	Chequamegon-Nicolet

Ottawa Table 2. Designations identified as RNA-equivalents for the Ottawa National Forest

Protected Area Designation	Managed by
Michigan Natural Areas on state-owned land that are documented and secure	Michigan Natural Feature Inventory
all Wisconsin State Natural Areas	Wisconsin Department of Natural Resources
all preserves of The Nature Conservancy	The Nature Conservancy (private) field offices in Michigan and Wisconsin

Ottawa Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Ottawa National Forest

Protected Area Designation*	Managed by
Special Areas, including Wilderness	USDA Forest Service (Ottawa & Chequamegon-Nicolet)
Environmental Areas	Great Lakes Program
National Parks & Lakeshores	National Park Service (*Possibly* RNA-equivalents, according to Pat Comer)
Private Nature Preserves	Private agencies other than The Nature Conservancy, *e.g.*, Michigan Nature Association, Little Traverse Conservancy, Cranbrook Institute Nature Preserve
Research Natural Areas	US Fish & Wildlife Service Michigan Parks and Recreation
Quiet Areas	Michigan Forest Management Division
Wilderness State Park	Michigan Parks and Recreation
Critical Dune Area	Land & Water Management
University preserves	Universities
Wisconsin State Parks & Forests	The majority are *not* RNA-equivalents, but special conservation designations within Parks or Forests *might* be (Eric Epstein, pers. comm.).

* See Ottawa Appendix E for listing of some specific areas within these categories

Ottawa Table 4. Subsections of the Ottawa National Forest (NF), in order of prominence
The 2 "NF acres" columns show the approximate number of ownership acres of national forest (NF) land in each subsection. "Ottawa NF Acres" is Ottawa National Forest land and "additional NF acres" is Chequamegon-Nicolet land in the same subsection. "Prominence" is the percentage of the subsection that is on national forest land: the first number is Ottawa land only ("Ottawa NF acres"/"Total subsection acres") and in parentheses is total NF land (("Ottawa" + "additional" NF acres)/"Total subsection acres"). These percentages do not add to 100. "Dominance" is "Ottawa NF acres" divided by "Ottawa total ownership"; these percentages do add to 100, within rounding error. All values are approximate. See also Ottawa Figure 3.

Subsection	Total subsection acres	Ottawa NF acres[§]	Additional NF acres[§] (C-N)	Prominence Percentage of subsection on NF lands	Dominance Percentage of Ottawa NF in subsection
212Jo—Ewen Dissected Lake Plain	325,395	115,987	--	36	12
212Jb*—Gogebic-Penokee Iron Range	970,789	235,072	33,997	24 (28)	24
212Jc*—Winegar Moraines	2,777,095	421,133	422,497	15 (30)	43
212Jl*—Brule and Paint Rivers-Drumlinized Ground Moraine	1,521,490	110,992	538,310	7.3 (43)	11
212Jn—Keweenaw Moraines and Plains	609,708	27,875	--	4.6	3
212Ja*—Lake Superior Clay Plain	1,326,484	52,292	12,864	3.9 (5)	5
212Jr—Michigamme Highlands	808,803	15,189	--	2	2
212Jm*—Northern Highlands Pitted Outwash	1,293,058	10,244	30,782	0.8 (3)	1
Ottawa total ownership:		988,784			

[§]These values were estimated by taking the proclamation acres for each subsection (from GIS analysis) and multiplying by the fraction of ownership to proclamation acres for the entire NF (63% for Ottawa). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. Purchase unit ownership acres were added directly to the calculated figures. (See also Methods.)
*The Chequamegon-Nicolet National Forest also occurs in this subsection.

Ottawa Table 5. Subsections of the Ottawa National Forest (NF), alliances reported on NF land in these subsections, and representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Ottawa Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. Alliances which occur on in a subsection on Chequamegon-Nicolet land but not on Ottawa land are included in this table but are not the responsibility of the Ottawa NF (see Ottawa Appendix C). The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) EDL= Ewen Dissected Lake; GPI= Gogebic-Penokee Iron Range; WM= Winegar Moraines; BPR= Brule and Paint Rivers, Drumlinized Ground Moraine; KMP=Keweenaw Moraines and Plains; LSC= Lake Superior Clay Plain; MH= Michigamme Highlands; NHO= Northern Highlands Pitted Outwash. For a list of alliances occurring in subsections of the Ottawa NF but not reported on NF land, see Ottawa Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB C	
Reported on NF land	• Reported in subsection	2 1	RNA
Possibly on NF land	▫ Possibly in subsection	(3) (2)	RNA-equivalent

--Subsections of Ottawa NF--

Community Pattern **Alliances Reported on NF Land**	212Jo (EDL)		212Jb* (GPI)		212Jc* (WM)		212Jl* (BPR)		212Jn (KMP)		212Ja* (LSC)		212Jr (MH)		212Jm* (NHO)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance	•		•		1 •		•		•		•		1 •		2 •	
Eastern Hemlock Forest Alliance	•		•		(1) •	(1)	1 •		•		•				(2) •	(1)
Eastern White Pine - Eastern Hemlock Forest Alliance	•		•		•		•	(1)	•		•				•	(1)
Jack Pine Forest Alliance	▫				•		•		•		•		•		•	
Red Pine Forest Alliance	▫		•		•		•		•		•				(2) •	(2)
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	•		•		•		•		•		•		•		•	
White Pine Forest Alliance			•		•		•		•		•		1 •		(1) •	(1)
White Spruce - Balsam Fir - Aspen Forest Alliance	•		•		•		•	1	•		(1) •				•	
White Spruce - Balsam Fir Forest Alliance	•		•		•		•		•		•		•			
Sugar Maple - American Basswood - (Red Oak) Forest Alliance			•		•		•				•				•	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	•		1 •		•	1 (1)	1 •	2		(1)	•		1 •		•	1
Quaking Aspen - Paper Birch Forest Alliance	•		•		•	1	1 •	1	(1)	•	•		•		(1) •	1
Jack Pine - (Red Pine) Wooded Herbaceous Alliance	▫		▫		•		▫		▫		•		•		(1) •	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Jack Pine - Oak (Northern Pin, Black) Forest Alliance	•		▫		•		•		•		•		•		•	

*This subsection is shared with the Chequamegon-Nicolet National Forest. Some shaded cells may not be ecosystems for the Ottawa to represent (see Ottawa Appendix C).

--Subsections of Ottawa NF--

Community Pattern **Alliances Reported on NF Land**	212Jo (EDL)	212Jb* (GPI)	212Jc* (WM)	212JI* (BPR)	212Jn (KMP)	212Ja* (LSC)	212Jr (MH)	212Jm* (NHO)
Northern White Cedar Forest Alliance	▪	▪	▪	▪	▪(1)	▪		▪
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance		▪	1 ▪	▪	▪	▪	▪	▪(2)
Black Oak - Northern Pin Oak Forest Alliance				▪		▪		▪
Red Oak - Sugar Maple - (White Oak) Forest Alliance	▪	▪	▪	1 ▪	▪	▪		
Sugar Maple - White Ash - American Basswood Forest Alliance	▪	▪	▪	▪	▪	▪		
Quaking Aspen Forest Alliance		▪	▪	▪		▪		▪
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	▪	▪	▪	▪	▪	▪		▪
Silver Maple Temporarily Flooded Forest Alliance		▪	▪	▪		▪		▪
Black Spruce - Tamarack Saturated Forest Alliance				▪				▪
Black Spruce Saturated Forest Alliance	▪	▪	1 ▪	1 1 ▪	▪	▪	1 ▪	1 (2) ▪(1)
Northern White Cedar - Red Maple Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪	
Northern White Cedar Saturated Forest Alliance	▪	▪	1 (1) ▪	▪	▪(1)	(1) ▪	▪	▪(1)
Black Ash - Red Maple Saturated Forest Alliance	▪	1 ▪	1 ▪	1 ▪	▪	(1) ▪	▪	▪
Tamarack Saturated Forest Alliance	▪	▪	1 ▪	▪	▪	▪	1 ▪	1 ▪
Black Spruce Saturated Woodland Alliance		▪	▪	▪	▪	▪		▪
White Pine - Oak (White, Red) Wooded Herbaceous Alliance		▪	▪	▪			▪	
Speckled Alder Seasonally Flooded Shrubland Alliance	▪	▪	1 (2) ▪	▪	▪(1)	(3) ▪	1 ▪	(2) ▪(2)
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪	▪	▪	(1) ▪	▪	(4) ▪		(3) ▪
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance		▪	▪	▫		▪		▫
Tussock Sedge Seasonally Flooded Herbaceous Alliance		▪	1 ▪	▪		▪		▪
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		▪	▪	1 (2) ▪		▪		(1) ▪
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		▪	▪	▪	▫	▪		▪
Rock Outcrop/Butte Sparse Vegetation		▪			▪(1)	▪	▪	▪

Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Trembling Aspen Temporarily Flooded Forest Alliance											▪					

*This subsection is shared with the Chequamegon-Nicolet National Forest. Some shaded cells may not be ecosystems for the Ottawa to represent (see Ottawa Appendix C).

Community Pattern **Alliances Reported on NF Land**	--Subsections of Ottawa NF-- 212Jo (EDL)	212Jb* (GPI)	212Jc* (WM)	212Jl* (BPR)	212Jn (KMP)	212Ja* (LSC)	212Jr (MH)	212Jm* (NHO)
Eastern Hemlock Saturated Forest Alliance	▪	▪	▪	▪	▪	▪		▪
White Pine - (Red Maple) Saturated Forest Alliance	▪	▪	▪	▪	▪	▪	▪	
(Jack Pine, Red Pine) Woodland Alliance			▪	▫	▪	▪		▪
Northern White-cedar Woodland Alliance	▪	▫	▫	▪	▪	▫	▪	
Common Juniper Shrubland Alliance		▪			▫	▪	▪	
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		▪	1 ▪	▪		▪		1 ▪
Bog Birch - (Willow) Saturated Shrubland Alliance			▪	▪		▪		▪
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance	▪	▪	(1) ▪	▪	▪	(1) ▪	▪	(6) ▪
Wild Rice Semipermanently Flooded Herbaceous Alliance	▫	▫	▫	▪	▫	▪		(1) ▪
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance		▪	▪	▪		▪		(1) ▪
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪	▪	▪
Open Bluff/Cliff Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪	
Wet Cliff Sparse Vegetation	▪	▪	▪	▪	▪		▪	
Lowland Talus Sparse Vegetation		▪			▫	▪		
Cobble/Gravel Shore Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪	
Inland Strand Beach Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪	▪
Sand Flats Temporarily Flooded Sparse Vegetation	▪	▪	▪	▪	▪	▪	▪	

*This subsection is shared with the Chequamegon-Nicolet National Forest. Some shaded cells may not be ecosystems for the Ottawa to represent (see Ottawa Appendix C).

Ottawa Table 6. RNAs and RNA-equivalents of the Ottawa National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec -tion	RNA (acres)	RNA-Equivalent (acres)	
		Michigan Natural Area or Wisconsin† SNA	TNC Preserve of MI or WI†
212Jo			
212Jb*	•Chequamegon Hardwoods (80)‡	•Fort Wilkins State Park Site (1)§	
212Jc*	•McCarthy Lake & Cedars (363)‡ •Spider Lake (94)‡	•Dunn Lake† •Mary Lake† •Moose Lake Hemlocks (40)† •Totagatic Highlands Hemlocks†	•Crab Lake Preserve (130)†§ •Flambeau Pines and Boreal Forest (220)†§ •Squaw Lake (67)
212Jl*	•Bose Lake (81)‡ •Grandma Lake Wetlands (495)‡ •McCaslin Mountain (524)‡	•Atkins Lake† •Bastille Lake†§ •Brule River Cliffs†§ •Fox Maple Woods† •Giant White Pine Grove (235)† •Glocke Lake† •Scott Lake-Shelp Lake Natural Area (272)†§ •Snow Falls Creek†§ •Wisconsin Slough†§	
212Jn			•Horseshoe Harbor (758)
212Ja*		•Bark Bay Slough (113)† •Bibon Swamp† •Big Bay Sand Spit and Bog† •Dwight's Point and Pokegama Wetlands†§ •Lost Creek Bog† •Porcupine Mountains (47,671)§ •Port Wing Boreal Forest† •Presque Isle River Scenic Site (1,465)§ •Sajdak Springs† •Union Springs Scenic Site (160)§	•Chequamegon Point (40)†§ •Kakagon Sloughs (81)† •Squaw Bay (12)†§
212Jr	•McCormick (3,675)	•Rocking Chair Lakes (240)§	

(cont.)

212Jm*	•Memorial Grove Hemlocks(64)‡ •Tucker Lake Hemlocks(158)‡	•Aurora Lake (250)† •Bass Lake Preserve† •Bittersweet Lakes (498)† •Black Tern Bog (26)† •Day Lake† •Escanaba Lake Hemlocks (130)† •Finnerud Pine Forest (120)† •Frog Lake and Pines† •Goodyear Springs-East† •High Lake Spruce-Balsam Forest (40)† •Holmboe Conifer Forest (32)† •Johnson Lake Barrens (105)† •Moose Lake† •Patterson Hemlocks† •Pine-Oak Grove†§ •Plum Lake Hemlock Forest (200)† •Rice Lake-Thunder Lake Marsh (250)† •Squirrel River Pines† •Stone Lake Pines† •Tomahawk River Pines† •Trout Lake Conifer Swamp (25)† •Turtle-Flambeau Flowage†§ •Wind Pudding Lake†	•Clifford F. Messinger Bass Lake Preserve (570)†§

*The Chequamegon-Nicolet National Forest also occurs in this subsection.
‡ Managed by the Chequamegon-Nicolet National Forest
§ We were unable to obtain community data for this area.
† Wisconsin

Ottawa Table 7. Summary of subsection representation on the Ottawa National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect in each subsection

The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212Jo. Ewen Dissected Lake Plain					0 *0%*
212Jb. Gogebic-Penokee Iron Range	1	1	80	1	81 *<1%*
212Jc. Winegar Moraines	2	7	457	457	914 *<1%*
212Jl. Brule and Paint Rivers-Drumlinized Ground Moraine	3	9	1,100	507	1,607 *<1%*
212Jn. Keweenaw Moraines and Plains		1		758	758 *<1%*
212Ja. Lake Superior Clay Plain		13		49,542	49,542 *<1%*
212Jr. Michigamme Highlands	1	1	3,675	240	3,915 *<1%*
212Jm. Northern Highlands Pitted Outwash	2	24	222	2,246	2,468 *<1%*
TOTAL	9	56	5,534	53,751	59,285 *1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land[§]	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212Jo. Ewen Dissected Lake Plain	25			0	
212Jb. Gogebic-Penokee Iron Range	40	1 *3%*		1 *3%*	1
212Jc. Winegar Moraines	39	8 *21%*	3 *8%*	9 *23%*	3
212Jl. Brule and Paint Rivers-Drumlinized Ground Moraine	45	7 *16%*	2 *4%*	8 *18%*	2
212Jn. Keweenaw Moraines and Plains	30		1 *3%*	1 *3%*	4
212Ja. Lake Superior Clay Plain	22		2 *9%*	2 *9%*	
212Jr. Michigamme Highlands	6	6 *100%*		6 *100%*	
212Jm. Northern Highlands Pitted Outwash	33	3 *9%*	10 *30%*	12 *36%*	5

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Ottawa Table 8. Alliances of the Ottawa National Forest arranged by community pattern and community distribution

COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	•Red Pine Forest •Jack Pine - (Red Pine) Wooded Herbaceous*	•Jack Pine - Oak (Northern Pin, Black) Forest •Bracken - Kalm's Brome Herbaceous*	•(Jack Pine, Red Pine) Woodland •Common Juniper Shrubland •Cobble/Gravel Shore
LIMITED	•Eastern White Pine - Eastern Hemlock Forest •White Pine Forest •Eastern Hemlock Forest •Eastern Hemlock - Yellow Birch Forest •White Pine - (Red Pine) - Quaking Aspen Forest	•Northern White Cedar Forest •Northern White Cedar Saturated Forest •Black Oak - Northern Pin Oak Forest* •Black Ash - Red Maple Saturated Forest •White Pine - (White Oak, Red Oak, Black Oak) Forest •Northern White Cedar - Red Maple Saturated Forest •White Pine - Oak (White, Red) Wooded Herbaceous*	•Eastern Hemlock Saturated Forest •Trembling Aspen Temporarily Flooded Forest* •White Pine - (Red Maple) Saturated Forest •Northern White Cedar Woodland •Wild Rice Semipermanently Flooded Herbaceous* •Knotweed - Mixed Forbs Temporarily Flooded Herbaceous* •Wet Cliff* •Inland Strand Beach*
WIDESPREAD	•Jack Pine Forest •White Spruce - Balsam Fir Forest •Sugar Maple - Yellow Birch - (American Beech) Forest •Quaking Aspen - Paper Birch Forest •White Spruce - Balsam Fir - Aspen Forest	•Black Spruce Saturated Forest •Tamarack Saturated Forest •Black Spruce - Tamarack Saturated Forest •Black Spruce Saturated Woodland •Speckled Alder Seasonally Flooded Shrubland •Leatherleaf Saturated Dwarf-Shrubland •Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous* •Tussock Sedge Seasonally Flooded Herbaceous* •Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous* •Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous* •Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous* •Rock Outcrop/Butte*	•Red Osier Dogwood - Willow Seasonally Flooded Shrubland* •Bog Birch - (Willow) Saturated Shrubland* •Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous* •Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous •Open Bluff/Cliff* •Sand Flats Temporarily Flooded Sparse Vegetation

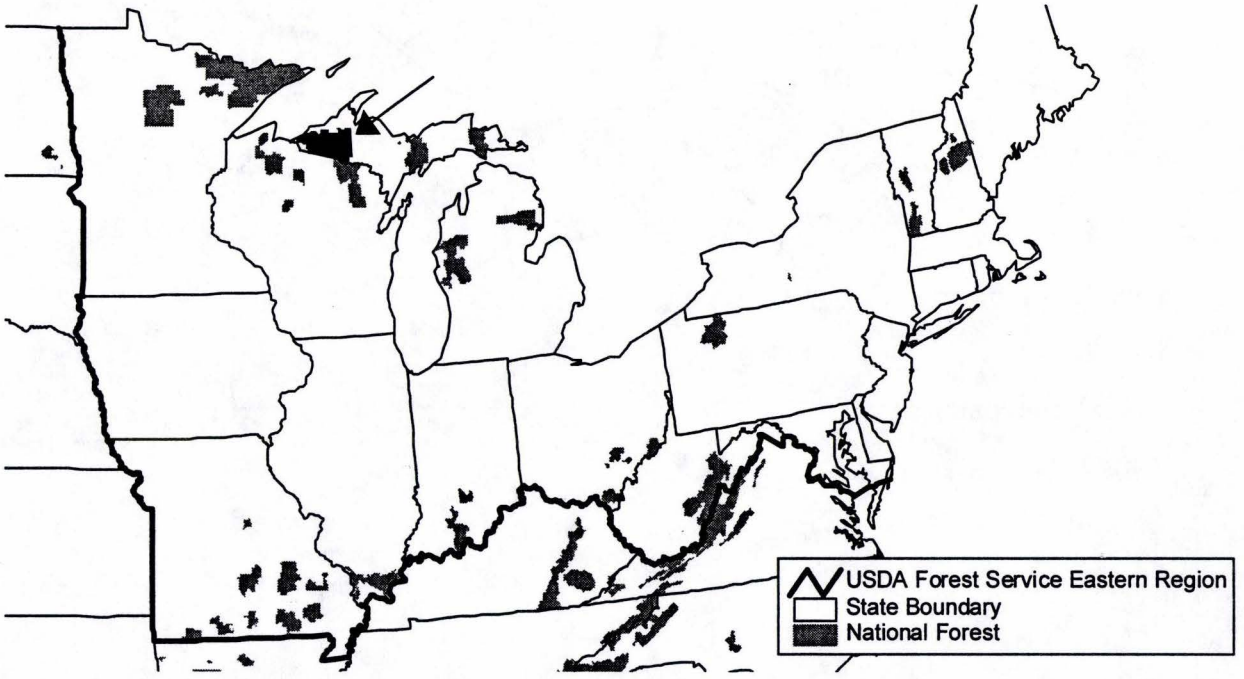
(cont.)

PERIPHERAL	•Sugar Maple - American Basswood - (Red Oak) Forest*	•Red Oak - Sugar Maple - (White Oak) Forest •Sugar Maple - White Ash - American Basswood Forest •Quaking Aspen Forest* •Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest •Silver Maple Temporarily Flooded Forest*	•Lowland Talus*

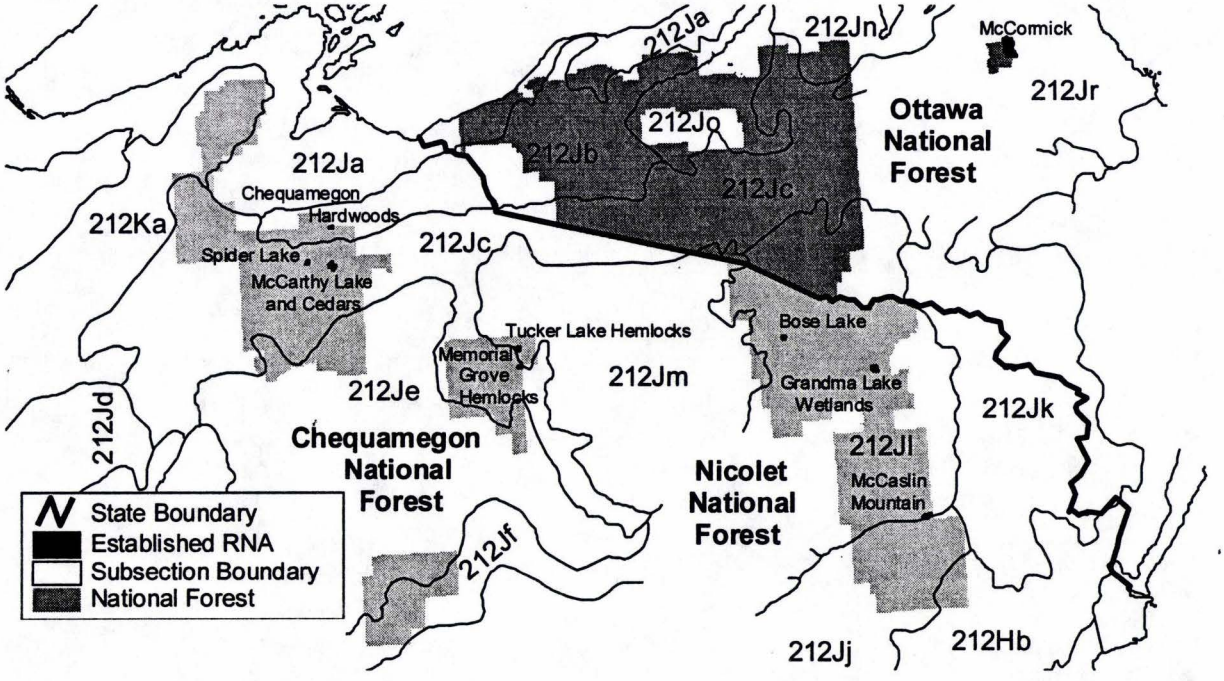
•* Not reported to occur on Ottawa National Forest Land, but reported to occur on Chequamegon-Nicolet land in one or more subsections shared with the Ottawa. Should be checked for occurrence on Ottawa land. See Ottawa Appendix D.

OTTAWA FIGURES

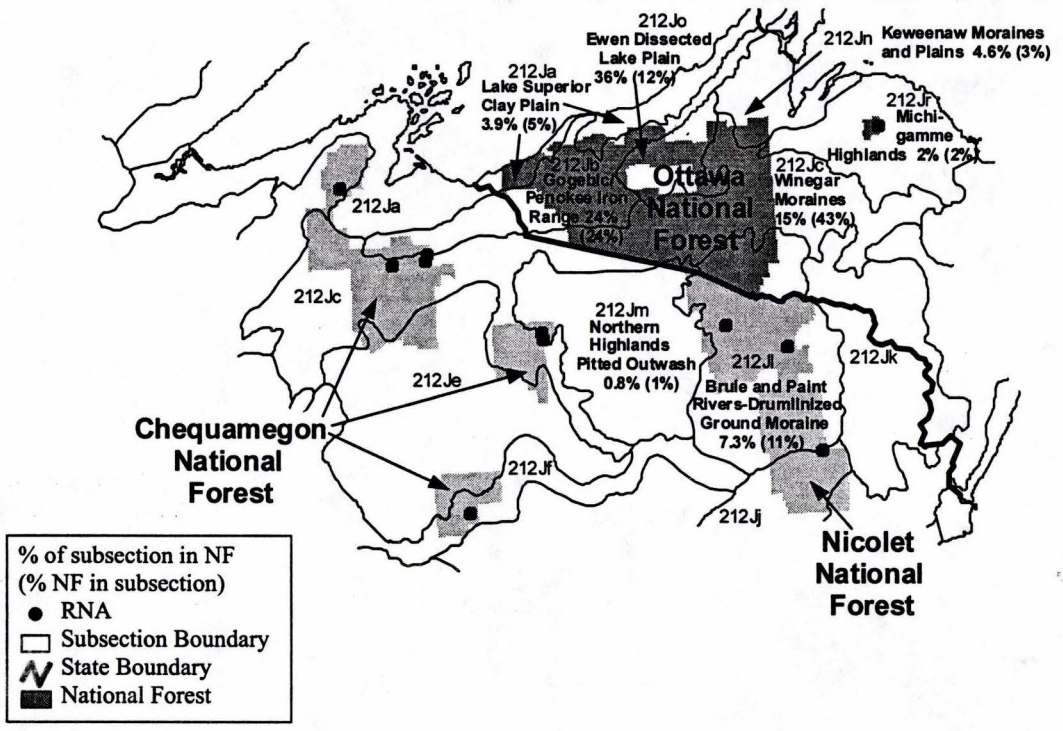
Ottawa Figure 1. Location of the Ottawa National Forest



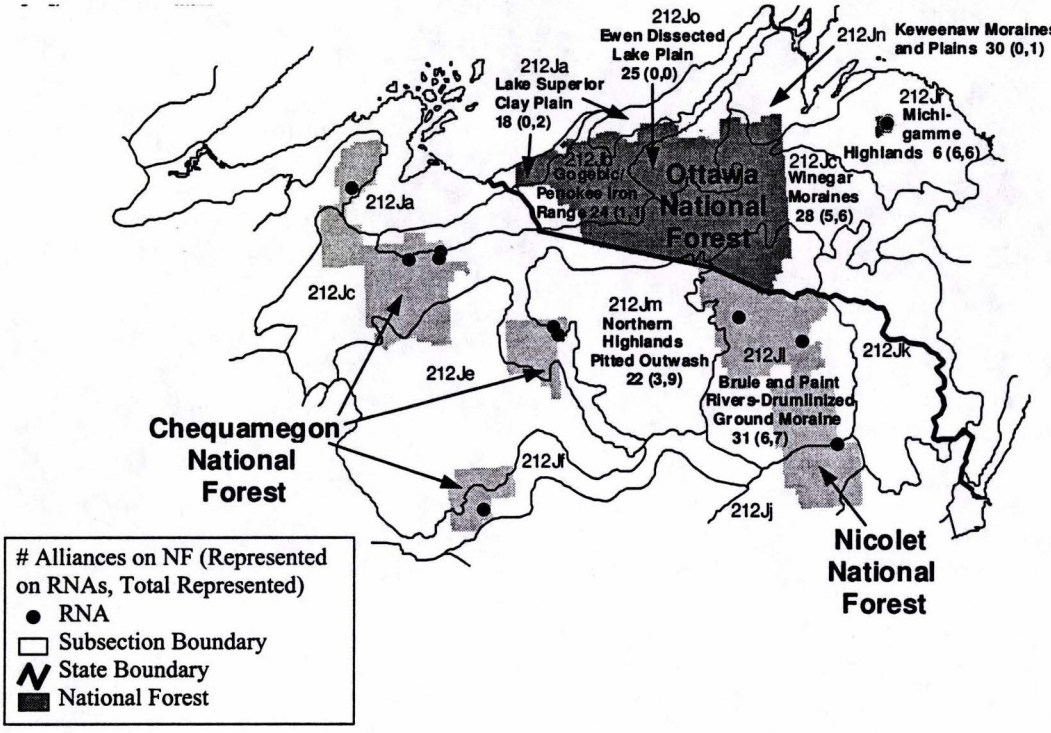
Ottawa Figure 2. The Ottawa National Forest with established RNAs and subsections. Chequamegon-Nicolet RNAs in shared subsections are included. A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Ottawa Figure 3. Ottawa National Forest in relation to subsections. National forests are shaded, but not all land in the shaded area is managed by the national forests. In each subsection the % of the subsection managed by the national forest (*prominence*) is shown, followed (in parentheses) by the % of national forest land (managed) in the subsection.



Ottawa Figure 4. Alliance representation on subsections of the Ottawa National Forest. National forests are shaded, but not all land in the shaded area is managed by the national forests. In each subsection is shown the number of alliances occurring on Ottawa National Forest land*, and in parentheses, the number of these represented by RNAs followed by the total number represented.



* In subsections shared by both National Forests, alliances found in the Chequamegon-Nicolet, but not the Ottawa, are not included in the total. Alliances can be represented in the Chequamegon-Nicolet, however.

OTTAWA APPENDICES

Ottawa Appendix A. Subsections of the Ottawa National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Ottawa Table 5 for information on the format of this table. The difference between these two tables is that Ottawa Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Ottawa Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Ottawa NF-- 212Jo (EDL)	212Jb* (GPI)	212Jc* (WM)	212Jl* (BPR)	212Jn (KMP)	212Ja* (LSC)	212Jr (MH)	212Jm (NHO)
Large Patch Alliances Rank:	AB C	AB C	AB C	AB C	AB C	AB C	AB C	AB C
Northern White Cedar - Yellow Birch Forest Alliance		▪				▪	▪	
White Pine - Oak (White, Northern Pin, Red) Woodland Alliance					(1) ▪			
Bur Oak - Oak (White, Northern Pin, Black) Woodland Alliance								▫
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance						▪		
American Beachgrass Herbaceous Alliance						▪		
River Bulrush Seasonally Flooded Herbaceous Alliance						▪		
Common Reed Semipermanently Flooded Herbaceous Alliance						▪		
Herbaceous Dunes Sparse Vegetation		▪			▪	▪		
Northern White Cedar Complex						▪		
Small Patch Alliances Rank:	AB C	AB C	AB C	AB C	AB C	AB C	AB C	AB C
White Spruce Wooded Herbaceous Alliance					▪			
Lake Sedge Seasonally Flooded Herbaceous Alliance		▫	▫	▪		▪		▪
Twig Rush Seasonally Flooded Herbaceous Alliance		▪			▪	▪		
Wiregrass Sedge Saturated Herbaceous Alliance								▪
Clay Slopes Sparse Vegetation						▪		
Open Pavement Sparse Vegetation		▪			(1) ▪	▪	▪	
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation					▪	▫		
Northern Sea Rocket Sparsely Vegetated Alliance						(3) ▪		

* The Chequamegon-Nicolet National Forest also occurs in this subsection.

Ottawa Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Ottawa National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Subsection 212Jo. Ewen Dissected Lake Plain						
		Ewen Dissected Lake Plain (212Jo) Total:				
Subsection 212Jb. Gogebic-Penokee Iron Range						
Matrix Alliances						
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Chequamegon Hardwoods		75	C AB B	B	
Large Patch Alliances						
Black Ash - Red Maple Saturated Forest Alliance	Chequamegon Hardwoods		5	CD AB B	BC	
		Gogebic-Penokee Iron Range (212Jb) Total:	80			
Subsection 212Jc. Winegar Moraines						
Matrix Alliances						
Eastern Hemlock - Yellow Birch Forest Alliance	McCarthy Lake & Cedars		14	C AB B	B	
Eastern Hemlock Forest Alliance		Moose Lake Hemlocks	23	D AB BC	BC	
		Totagatic Highlands Hemlocks	104	C A BC	B	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	McCarthy Lake & Cedars		13	D AB B	BC	
		Squaw Lake	67	C AB BC	BC	
Quaking Aspen - Paper Birch Forest Alliance	McCarthy Lake & Cedars		26	D AB B	BC	
Large Patch Alliances						
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	McCarthy Lake & Cedars		5	CD AB B	BC	
Black Spruce Saturated Forest Alliance	McCarthy Lake & Cedars		42	C AB B	B	
Northern White Cedar Saturated Forest Alliance	McCarthy Lake & Cedars		106	B AB B	B	
		Totagatic Highlands Hemlocks	43	C A BC	B	
Black Ash - Red Maple Saturated Forest Alliance	Spider Lake		94	B AB B	B	
Tamarack Saturated Forest Alliance	McCarthy Lake & Cedars		21	C AB B	B	
Speckled Alder Seasonally Flooded Shrubland Alliance	McCarthy Lake & Cedars		30	C AB B	B	
		Dunn Lake	130	B AB BC	B	
		Totagatic Highlands Hemlocks	13	C AB BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance	McCarthy Lake & Cedars		0		I	
Tussock Sedge Seasonally Flooded Herbaceous Alliance	McCarthy Lake & Cedars		40	C AB B	B	
Small Patch Alliances						

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	McCarthy Lake & Cedars		15	C AB B	B	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Dunn Lake	80	A AB BC	A	
		Winegar Moraines (212Jc) Total:	866			

Subsection 212Jl. *Brule and Paint Rivers-Drumlinized Ground Moraine*

Matrix Alliances

Eastern Hemlock Forest Alliance	Bose Lake		25	D A B	B	
Eastern White Pine - Eastern Hemlock Forest Alliance		Giant White Pine Grove	30	D AB BC	BC	
White Spruce - Balsam Fir - Aspen Forest Alliance	Grandma Lake Wetlands		16	D AB B	BC	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Bose Lake		15	D AB B	BC	
	Grandma Lake Wetlands		100	C AB B	B	
	McCaslin Mountain		34	D AB B	BC	
Quaking Aspen - Paper Birch Forest Alliance	Bose Lake		37	D AB B	BC	
	Grandma Lake Wetlands		60	C AB B	B	
	McCaslin Mountain ?		191	C AB B	QB	?

Large Patch Alliances

Red Oak - Sugar Maple - (White Oak) Forest Alliance	McCaslin Mountain		282	B AB B	B	
Black Spruce Saturated Forest Alliance	Bose Lake		4	D AB B	BC	
	Grandma Lake Wetlands		140	B AB B	B	
Black Ash - Red Maple Saturated Forest Alliance	McCaslin Mountain		9	C AB B	B	
White Pine - Oak (White, Red) Wooded Herbaceous Alliance	McCaslin Mountain ?		8	B AB B	QB	?
Leatherleaf Saturated Dwarf-Shrubland Alliance	Grandma Lake Wetlands ?		0		QI	?
		Atkins Lake	15	C AB BC	B	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	Grandma Lake Wetlands		135	B A B	B	
		Atkins Lake	10	B A BC	B	
		Glocke Lake	12	C A BC	B	
		Brule and Paint Rivers-Drumlinized Ground Moraine (212Jl) Total:	1,123			

Subsection 212Jn. *Keweenaw Moraines and Plains*

Matrix Alliances

Sugar Maple - Yellow Birch - (American Beech) Forest Alliance		Horseshoe Harbor	73	C AB BC	BC	
Quaking Aspen - Paper Birch Forest Alliance		Horseshoe Harbor	544	B AB BC	B	

Large Patch Alliances

Northern White Cedar Forest Alliance		Horseshoe Harbor	18	C AB BC	BC	
Northern White Cedar Saturated Forest Alliance		Horseshoe Harbor	13	C AB BC	BC	
White Pine - Oak (White, Northern Pin, Red) Woodland Alliance		Horseshoe Harbor	69	B AB BC	B	
Speckled Alder Seasonally Flooded Shrubland Alliance		Horseshoe Harbor	1	D AB BC	C	
Rock Outcrop/Butte Sparse Vegetation		Horseshoe Harbor	4	D AB BC	C	

Small Patch Alliances

White Spruce Wooded Herbaceous Alliance		Horseshoe Harbor	6	A BC		

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Open Pavement Sparse Vegetation		Horseshoe Harbor	34	B A BC	B
		Keweenaw Moraines and Plains (212Jn) Total:	762		

Subsection 212Ja. *Lake Superior Clay Plain*

Matrix Alliances

White Spruce - Balsam Fir - Aspen Forest Alliance		Port Wing Boreal Forest	100	C AB BC	B

Large Patch Alliances

Northern White Cedar Saturated Forest Alliance		Bibon Swamp	913	A AB BC	A
Black Ash - Red Maple Saturated Forest Alliance		Bibon Swamp	800	A AB BC	A
Speckled Alder Seasonally Flooded Shrubland Alliance		Bark Bay Slough	18	C AB BC	B
		Bibon Swamp	2,949	A AB BC	A
		Kakagon Sloughs	0		
		Port Wing Boreal Forest	26	C AB BC	B
Leatherleaf Saturated Dwarf-Shrubland Alliance		Bark Bay Slough	213	B AB BC	B
		Big Bay Sand Spit and Bog	306	B AB BC	B
		Kakagon Sloughs	0		
		Lost Creek Bog	150	B AB BC	B
		Port Wing Boreal Forest	37	C AB BC	B
American Beachgrass Herbaceous Alliance		Port Wing Boreal Forest ?	5	C AB BC	QBC ?
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		Kakagon Sloughs	0		
Herbaceous Dunes Sparse Vegetation		Port Wing Boreal Forest ?	5	C AB BC	QBC ?

Small Patch Alliances

Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Bibon Swamp	913	A AB BC	A
		Kakagon Sloughs	0		
Northern Sea Rocket Sparsely Vegetated Alliance		Bark Bay Slough	23	B AB BC	B
		Big Bay Sand Spit and Bog	34	B AB BC	B
		Port Wing Boreal Forest	10	B AB BC	B
		Lake Superior Clay Plain (212Ja) Total:	6,502		

Subsection 212Jr. *Michigamme Highlands*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance	McCormick		100	C AB B	B
White Pine Forest Alliance	McCormick		125	B AB B	B
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	McCormick		2,680	B A B	B

Large Patch Alliances

Black Spruce Saturated Forest Alliance	McCormick		545	A AB B	A
Tamarack Saturated Forest Alliance	McCormick		50	B AB B	B
Speckled Alder Seasonally Flooded Shrubland Alliance	McCormick		50	B AB B	B
		Michigamme Highlands (212Jr) Total:	3,550		

Subsection 212Jm. *Northern Highlands Pitted Outwash*

Matrix Alliances

Eastern Hemlock - Yellow Birch Forest Alliance	Memorial Grove Hemlocks		64	C AB B	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Eastern Hemlock - Yellow Birch Forest Alliance	Tucker Lake Hemlocks		68	C AB B	B	
Eastern Hemlock Forest Alliance		Escanaba Lake Hemlocks	25	D A BC	BC	
		Patterson Hemlocks	410	C A BC	B	
		Plum Lake Hemlock Forest	188	C A BC	B	
Eastern White Pine - Eastern Hemlock Forest Alliance		Holmboe Conifer Forest	17	D AB BC	BC	
Red Pine Forest Alliance		Finnerud Pine Forest	84	C A BC	B	
		Squirrel River Pines	41	D B BC	BC	
		Stone Lake Pines	15	D A BC	BC	
		Tomahawk River Pines	80	C A BC	B	
White Pine Forest Alliance		Frog Lake and Pines	150	C AB BC	B	
		High Lake Spruce-Balsam Forest	40	D B BC	BC	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Tucker Lake Hemlocks		21	D AB B	BC	
Quaking Aspen - Paper Birch Forest Alliance	Tucker Lake Hemlocks		39	D AB B	BC	
		Aurora Lake ?	33	D B BC	QBC	?
		Bittersweet Lakes	345	B AB BC	B	
Jack Pine - (Red Pine) Wooded Herbaceous Alliance		Johnson Lake Barrens	76	C B BC	B	
Large Patch Alliances						
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance		Holmboe Conifer Forest	5	D B BC	BC	
		Trout Lake Conifer Swamp	10	C B BC	BC	
Black Spruce Saturated Forest Alliance	Tucker Lake Hemlocks		12	C AB B	B	
		Aurora Lake	25	C B BC	B	
		Escanaba Lake Hemlocks	80	B B BC	B	
		Holmboe Conifer Forest	9	C B BC	BC	
Northern White Cedar Saturated Forest Alliance		Trout Lake Conifer Swamp	14	C C BC	BC	
Tamarack Saturated Forest Alliance	Tucker Lake Hemlocks		15	C AB B	B	
Speckled Alder Seasonally Flooded Shrubland Alliance		Holmboe Conifer Forest	1	D B BC	BC	
		Moose Lake	5	D B BC	BC	
		Rice Lake-Thunder Lake Marsh	40	C AB BC	B	
		Tomahawk River Pines	212	B AB BC	B	
Leatherleaf Saturated Dwarf-Shrubland Alliance		Aurora Lake	98	B B BC	B	
		Finnerud Pine Forest	36	C A BC	B	
		Stone Lake Pines	50	B A BC	B	
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Black Tern Bog	26	C AB BC	B	
Small Patch Alliances						
Eastern Hemlock Saturated Forest Alliance		Moose Lake ?	17	B AB BC	QB	?
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	Tucker Lake Hemlocks		3	D AB B	BC	
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Bass Lake Preserve	70	A B BC	B	
		Goodyear Springs-East	135	A AB BC	B	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank	?
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Johnson Lake Barrens	31	B AB BC	B	
		Moose Lake	10	B AB BC	B	
		Rice Lake-Thunder Lake Marsh	92	A AB BC	B	
		Squirrel River Pines	20	B AB BC	B	
Wild Rice Semipermanently Flooded Herbaceous Alliance		Aurora Lake	94	A AB BC	B	
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance		Patterson Hemlocks	10	B AB BC	B	
		Northern Highlands Pitted Outwash (212Jm) Total:	2,816			
		Grand Total:	15,699			

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Ottawa Appendix C. Unrepresented alliances (Forest-wide) on the Ottawa National Forest

The following alliances are not represented in any of the subsections in which they occur on Ottawa National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- Jack Pine Forest Alliance (matrix, widespread)
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance (matrix, limited)
- Eastern White Pine - Eastern Hemlock Forest Alliance (matrix, limited)
- White Spruce - Balsam Fir Forest Alliance (matrix, widespread)
- Northern White Cedar Forest Alliance (large patch, limited)
- Jack Pine - Oak (Northern Pin, Black) Forest Alliance (large patch, endemic)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (large patch, limited)
- Sugar Maple - White Ash - American Basswood Forest Alliance (large patch, peripheral)
- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (large patch, peripheral)
- Black Spruce - Tamarack Saturated Forest Alliance (large patch, widespread)
- Northern White Cedar - Red Maple Saturated Forest Alliance (large patch, limited)
- Black Spruce Saturated Woodland Alliance (large patch, widespread)
- Eastern Hemlock Saturated Forest Alliance (small patch, limited)
- White Pine - (Red Maple) Saturated Forest Alliance (small patch, limited)
- (Jack Pine, Red Pine) Woodland Alliance (small patch, endemic)
- Northern White Cedar Woodland Alliance (small patch, limited)
- Common Juniper Shrubland Alliance (small patch, endemic)
- Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance (small patch, widespread)
- Cobble/Gravel Shore Sparse Vegetation (small patch, endemic)
- Sand Flats Temporarily Flooded Sparse Vegetation (small patch, widespread)

Ottawa Appendix D. Alliances reported on national forest land (Chequamegon-Nicolet) but not on Ottawa National Forest land

Subsection	Alliance
212Ja	White Pine Forest Alliance[1]
	White Spruce - Balsam Fir Forest Alliance[1]
	Quaking Aspen Forest Alliance*
	Trembling Aspen Temporarily Flooded Forest Alliance*
212Jb	Sugar Maple - American Basswood - (Red Oak) Forest Alliance*
	Quaking Aspen Forest Alliance*
	Silver Maple Temporarily Flooded Forest Alliance*
	Northern White Cedar Saturated Forest Alliance[2]
	Speckled Alder Seasonally Flooded Shrubland Alliance[2]
	Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance*
	Tussock Sedge Seasonally Flooded Herbaceous Alliance*
	Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance*[2]
	Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance*
	Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance*
	Rock Outcrop/Butte Sparse Vegetation*
	Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance*
	Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance*
	Open Bluff/Cliff Sparse Vegetation*[1]
	Wet Cliff Sparse Vegetation*
	Lowland Talus Sparse Vegetation*
212Jc	Sugar Maple - American Basswood - (Red Oak) Forest Alliance*
	Jack Pine - (Red Pine) Wooded Herbaceous Alliance*[1]
	Quaking Aspen Forest Alliance*
	Silver Maple Temporarily Flooded Forest Alliance*
	Speckled Alder Seasonally Flooded Shrubland Alliance[2]
	Tussock Sedge Seasonally Flooded Herbaceous Alliance*
	Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance*[1]
	Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance*
	Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance*
	Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance*
	Inland Strand Beach Sparse Vegetation*[1]

(cont.)

(cont. from previous page)

Subsection	Alliance
212Jl	Black Oak - Northern Pin Oak Forest Alliance*
	White Pine - Oak (White, Red) Wooded Herbaceous Alliance*
	Tussock Sedge Seasonally Flooded Herbaceous Alliance*
	Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance*[2]
	Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance*
	Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance*
	Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance*
	Bog Birch - (Willow) Saturated Shrubland Alliance*
	Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance*[2]
	Wild Rice Semipermanently Flooded Herbaceous Alliance*[2]
	Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance*
	Open Bluff/Cliff Sparse Vegetation*
	Wet Cliff Sparse Vegetation*
	Inland Strand Beach Sparse Vegetation*[1]
212Jm	Sugar Maple - American Basswood - (Red Oak) Forest Alliance*
	Quaking Aspen Forest Alliance*
	Silver Maple Temporarily Flooded Forest Alliance*
	Tussock Sedge Seasonally Flooded Herbaceous Alliance*
	Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance*
	Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance*
	Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance*
	Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance*
	Wild Rice Semipermanently Flooded Herbaceous Alliance*
	Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance*
	Inland Strand Beach Sparse Vegetation*

* This alliance has not been reported to occur on Ottawa National Forest land in *any* subsection.
[1] This alliance likely does *not* occur on Ottawa land in this subsection.
[2] This alliance likely *does* occur on Ottawa land in this subsection.

Ottawa Appendix E. Potential RNA-equivalents from the Michigan Natural Heritage Database and the Chequamegon National Forest Representative RNA Pilot Study (1994)

- **These areas have not been evaluated for RNA-equivalency.**
- An entire area or a definable portion of an area may be determined to be an RNA-equivalent.

Areas containing Element Occurrences (EOs) in the Michigan Natural Heritage Database
The list of subsections comes from an digital overlay of the centrum point of each EO with the subsection map of Keys *et al.* (1995). They do not necessarily correctly identify the subsection(s) in which the managed area occurs.

Agency	Name	Subsection(s)
USFS (Ottawa)	Sylvania National Recreation Area	212Jc, 212Jm
	Sturgeon River Gorge Wilderness	
Great Lakes Program	Pequaming Environmental Area	212Jn
	Second Sand Beach Environmental Area	212Jn
	Squaw Bay Environmental Area	212Jr, 212Hl/i
Michigan Parks and Recreation	Porcupine Mountains Wilderness State Park	212Jb
	Hoffmaster Natural Area	222Ja
Michigan Nature Association	Five Lakes Muskegon Plant Preserve	222Ja
	Keweenaw Shore #1 Plant Preserve	212Jb
	Estivant Pines Nature Sanctuary	212Jb
	Grinnel Memorial Nature Sanctuary	212Jn
Cranbrook Institute	Huron Mountain Club Nature Research Area	212Jr

Chequamegon-Nicolet National Forest Wilderness & Special Areas
Identified in the Chequamegon pilot as potential RNA-equivalents.

Name	Subsection	Acres
Morgan Falls	212Jb	64
Rainbow Lake Wilderness	212Jc	1,200
Chippewa Pines	212Jc	17
Ghost Lake	212Jc	26
Goblin Woods	212Jc	10
Hay Lake	212Jc	37
Spillerberg	212Jc	30

IX. K. Shawnee National Forest RNA Assessment

SHAWNEE SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Shawnee National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Shawnee National Forest land. The Shawnee occupies portions of 10 subsections. Alliances on National Forest land have not been identified on 2 minor Shawnee subsections (222Db and 234An) and are incomplete on a third minor subsection (222Gb). Based on data from the remaining 7 subsections, 26 alliances occur on Shawnee lands, with the number of known alliances in each subsection ranging from 7 to 15. Based on the available data, there are 79 alliance-subsection combinations on Shawnee lands; these are the ecosystems to represent for the Shawnee National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Thirty-four of the 79 Shawnee National Forest alliance-subsection combinations (ecosystems) are represented by the 10 currently established Shawnee RNAs.

Existing **RNA-equivalents** in these subsections include:

- 18 Illinois Nature Preserves,
- 3 Missouri Designated Natural Areas, and
- 4 preserves of The Nature Conservancy.

These 25 RNA-equivalents, along with the 10 RNAs, cover 11,405 acres, about 4% of the approximately 277,000 acres managed by the Shawnee National Forest, and less than 1% of the total area of the subsections. They currently represent 43 (56%) of the Shawnee alliance-subsection combinations (ecosystems).

UNREPRESENTED ECOSYSTEMS

The Shawnee National Forest has 34 ecosystems that are unrepresentated by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating other areas or designations as possible RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in

which representation of biological diversity (alliances) is low, **high-priority subsections** for the Shawnee National Forest are:

- Cretaceous Hills (222Ca),
- Greater Shawnee Hills (222Dh), and
- Lesser Shawnee Hills (222Di).

The Shawnee has high prominence in Subsections 222Dh (27%) and 222Di (15%). Prominence in Subsection 222Ca is lower (6%), but this subsection is highest priority because none of the alliances are currently represented.

All other subsections are **low-priority subsections**: All alliances identified on Shawnee lands in the Illinois Ozarks (222Aq) have been represented. The Shawnee has prominence of 3% or less in the remaining subsections: Ohio and Cache River Alluvial Plain (222Ch), Mississippi River Alluvial Plain (222Ao), Lower Ohio-Cache-Wabash Alluvial Plains (222Db), Lower Wabash Alluvial Plain (222Gc), Mount Vernon Hill Country (222Gb), and North Mississippi River Alluvial Plain (234An). They should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

Using the approach of prioritizing by matrix alliances, there are 4 **high-priority alliances** (of 26 Shawnee alliances). These may be high-priority in each subsection in which they occur. All are represented in at least 1 subsection, but 3 are not represented in all subsections in which they occur on Shawnee land:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance
- Black Oak - White Oak Forest Alliance
- Bald-cypress Semi-permanently Flooded Forest Alliance

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IX.K.1. INTRODUCTION

This document presents the Shawnee National Forest portion of the Regional RNA Assessment. Portions of the Overview are summarized here, but with information specific to the Shawnee.

The Shawnee National Forest is located in southern Illinois (Shawnee Figure 1). Its proclamation boundaries and purchase unit boundaries contain 841,485 acres, with 277,496 acres (33%) of this land currently (FY97) managed by the Shawnee. Although National Forests may acquire more land within proclamation boundaries and purchase units, RNAs are not likely to be established on inholdings anytime in the near future. Therefore in this assessment we focus on lands managed by the USFS, which we call "National Forest land" or "National Forest ownership."

IX.K.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Shawnee.

IX.B.2.a. Subsections

A list of subsections for the Shawnee National Forest was provided in the representative RNA pilot study conducted in 1994 for the Shawnee. The National Hierarchy subsection codes have changed since then; we updated them based on subsection names. The boundaries of a few of the minor Shawnee subsections (222Db, 222Gc, 234An) have changed since the pilot, so information for these subsections needs review. We verified the current (Keys *et al.* 1995) subsection list for the Shawnee with Max Hutchison, Ecologist with the Ullin Office of the Nature Conservancy and Beth Shimp and Andy Rorick of the Shawnee National Forest.

We used the Keys *et al.* (1995) subsection map and the 1972 Shawnee National Forest map to determine the amount of land in each subsection within Shawnee proclamation boundaries. We considered ownership acreage within each subsection as 33% of the acreage within proclamation boundaries, based on the ration of ownership to proclamation acres for the entire Shawnee National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percent of national forest land (ownership) in each subsection, and the percent of each subsection with Shawnee National Forest land (ownership).

The percentage of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percentage of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.K.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for the Shawnee, we first used information provided in the Shawnee 1994 pilot study. This study listed alliances occurring on National Forest land in each subsection. Because the alliance classification had been modified since 1994, some translation of these alliances was necessary. Subsections were also updated, as described in the previous section.

The data from the pilot were supplemented using natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated

to associations (one classification level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on National Forest land. However, most of the data added from Heritage databases do not have information about presence on National Forest land.

Some of the Element Occurrence data were provided by Illinois natural divisions (Schwegman 1973; no scale given, but larger than the subsection map). In general these correspond well to the Keys *et al.* (1995) subsections. The exceptions relevant to the Shawnee NF are 222Db, 222Gc, and 234An. These are minor subsections on the Shawnee, but information for these subsections needs review.

IX.K.2.c. Identifying RNA-equivalents

RNA-equivalents and their locations were reviewed with Max Hutchison. The RNA Committee of the Shawnee National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.K.2.d. Digitizing RNAs

The Shawnee National Forest provided USGS 7.5 minute (1:24,000 scale) topographical maps with outlines of RNA boundaries. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Shawnee RNAs (Shawnee Figure 2) in the projection used by the Shawnee (UTM 16 NAD 27), or a Region-wide RNA cover at regional projections.

IX.K.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All Establishment Records for the 10 Shawnee National Forest RNAs contain information about vegetation in the form of SAF cover types, with total acreage or percentage of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

For RNA-equivalents (Illinois State Nature Preserves and TNC Preserves), our sources for community occurrences were Element Occurrence data from the Illinois Natural Heritage Program, including Illinois Natural Areas Inventory files. Total acreage for each Illinois Nature Preserve came from the Illinois Natural Heritage Program.

We reviewed all decisions and results with Max Hutchison. Questions remain for several of the Illinois Nature Preserves (Shawnee Appendix B).

If we were very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Shawnee Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Shawnee National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.K.3. RESULTS

This section summarizes what alliance-subsection combinations occur on the Shawnee National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.K.3.a Subsections on national forest land

The 10 subsections that occur on Shawnee National Forest land are listed below (Shawnee Figure 2). These subsections are listed in order of *prominence*, the percentage of the subsection on national forest land (Shawnee Table 4).

- Greater Shawnee Hills (222Dh)
- Lesser Shawnee Hills (222Di)
- Cretaceous Hills (222Ca)
- Illinois Ozarks (222Aq)
- Ohio and Cache River Alluvial Plain (222Ch)
- Mississippi River Alluvial Plain (222Ao)
- Lower Ohio-Cache-Wabash Alluvial Plain (222Db)
- Lower Wabash Alluvial Plain (222Gc)
- Mount Vernon Hill Country (222Gb)
- North Mississippi River Alluvial Plain (234An)

The majority of the Shawnee National Forest land occurs on two subsections (Shawnee Table 4, Shawnee Figure 3): Greater Shawnee Hills (222Dh, 55%) and Lesser Shawnee Hills (222Di, 22%). Large portions of these same 2 subsections are managed by the Shawnee National Forest—approximately 27% of 222Dh and 15% of 222Di—*i.e.,* the Shawnee has high *prominence* of land coverage in these subsections.

The Shawnee has about 6% prominence in the Cretaceous Hills (222Ca) and Illinois Ozarks (222Aq), and 4% and 11% of national forest land occurs in these subsections, respectively. The remaining 6 subsections each occupy ≤6% of national forest land, and the Shawnee manages ≤4% of each of the subsections.

The Lower Ohio-Cache-Wabash Alluvial Plains (222Db) was formerly the southeastern portion of the Lower Wabash Alluvial Plain (222Gc), and together they comprised division 10a of the Natural Divisions of Illinois (Schwegman 1973). All alliances in division 10a were attributed to 222Gc, which is by far the largest portion. Information on 222Db is lacking.

The North Mississippi River Alluvial Plain (234An) was formerly part of Ohio and Cache River Alluvial Plain (222Ch), and together they comprised division 14b of the Natural Divisions of Illinois (Schwegman 1973). All alliances in division 14b were attributed to 222Ch, which is by far the largest portion. Information on 234An is lacking.

The subsection boundary between 222Di (Lesser Shawnee Hills) and 222Ch (Ohio and Cache River Alluvial Plain) is problematic in the Cache River area. If the line is eventually revised it may affect some of our results. In particular, the Heron Pond - Little Black Slough State Nature Preserve occurs on the subsection boundary between 222Di and 222Ch. We entered information as if the Preserve occurred entirely in Subsection 222Di, based on Max Hutchison's recommendation.

IX.K.3.b. Natural communities in subsections

A total of 56 alliances are reported to occur in these 10 subsections. Alliances on national forest land have no been identified on 2 minor Shawnee subsections (222Db and 234An). Based on data from the remaining 8 subsections, 26 alliances occur on national forest land (Shawnee Table 5, first column). The

30 alliances not reported to occur on national forest land are listed in Shawnee Appendix A; they can be reviewed for their presence on national forest land.

Of the 26 alliances reported to occur on the Shawnee National Forest, 4 are **matrix** alliances (see Shawnee Table 5, first set of alliances), 15 are **large patch** (second set) and 7 are **small patch** (third set). (See "National Vegetation Classification" in Overview.)

The number of alliances on national forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on Shawnee land in each subsection:

- Greater Shawnee Hills (222Dh): 13 alliances (3 matrix, 5 large patch, 5 small patch)
- Lesser Shawnee Hills (222Di): 15 alliances (3 matrix, 7 large patch, 5 small patch)
- Cretaceous Hills (222Ca): 8 alliances (2 matrix, 4 large patch, 2 small patch)
- Illinois Ozarks (222Aq): 14 alliances (3 matrix, 7 large patch, 4 small patch)
- Ohio & Cache River All. Plain (222Ch): 7 alliances (2 matrix, 3 large patch, 2 small patch)
- Mississippi River Alluvial Plain (222Ao): 13 alliances (4 matrix, 7 large patch, 2 small patch)
- Lower Ohio-Cache-Wabash All. Plain (222Db): *unknown*
- Lower Wabash Alluvial Plain (222Gc) 7 alliances (1 matrix, 4 large patch, 2 small patch)
- Mount Vernon Hill Country (222Gb): 2 alliances (1 matrix, 1 large patch; *incomplete*)
- N. Mississippi River All. Plain (234An): *unknown*

There are a total of 79 subsection-alliance combinations identified on Shawnee land. Shawnee Table 5 shows the alliances that occur in each subsection.

IX.K.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in both RNAs and RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and RNA-equivalents in each subsection is shown in the appropriate cells of Shawnee Table 5. Only high-quality occurrences provide representation. (The quality of some low-ranked occurrences may have improved since they were surveyed in the early to mid-1970s.) The land area and alliances represented in each subsection are summarized below. D-ranked and unranked occurrences are not addressed; see Shawnee Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

As of January 1999, the Shawnee National Forest had 10 established RNAs (Shawnee Table 1, 6). The LaRue-Pine Hills/Otter Pond RNA straddles the boundary of Subsections 222Aq and 222Ao, and the alliances that occur in both subsections are recorded for both subsections. Thus this RNA may appear in some tables to be counted as two research natural areas. The other nine established Shawnee RNAs occur in a single subsection.

A digital cover of the established RNAs on the Shawnee National Forest (Shawnee Figure 2) is available in the projection used by the Shawnee (UTM 16 NAD 27) from the Regional RNA Coordinator. Regional RNA covers are also available.

RNA-equivalents

Some subsections of the Shawnee National Forest occur in both Illinois and Missouri. Therefore RNA-equivalents in both states are relevant. For this assessment, the authors, along with Max Hutchison, Ecologist with the Ullin Office of the Nature Conservancy, have considered the following areas to be RNA-equivalents for the Shawnee National Forest (Shawnee Table 2):

- Illinois Nature Preserves
- Missouri Designated Natural Areas
- preserves of The Nature Conservancy (TNC)

On this basis, 4 Nature Conservancy preserves and 25 Illinois natural areas serve as RNA-equivalents for the Shawnee National Forest assessment (Shawnee Table 6, 7a). (Fults Hill Prairie—Kidd Lake Marsh Nature Preserve straddles the boundary of Subsections 222Aq and 222Ao, and the alliances on each side are represented in their respective subsections.) The total acreage of these natural areas is < 1% of the total area of the subsections (Shawnee Table 7a).

Additional designations may provide RNA-equivalents, but have not yet been evaluated (Shawnee Table 3). At present Illinois State Natural Areas, Shawnee National Forest Ecological Areas (see Shawnee Appendix D), and National Natural Landmarks do not qualify as RNA-equivalents based on Level 1 protection. If the legal protection status (including management directives) of these areas is increased, then they could be reconsidered for RNA-equivalency. It may be useful to review the alliance-subsection combinations present in these areas (see Shawnee Appendix D) to determine what unrepresented ecosystems could be represented if one or more of these areas were established as RNAs or protected as RNA-equivalents.

Shawnee personnel can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

Greater Shawnee Hills (Subsection 222Dh)

Subsection 222Dh contains 4 RNAs, together covering 1,026 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Cave Hill RNA (465)
- Dennison Hollow RNA (205)
- Panther Hollow RNA (180)
- Stoneface RNA (176).

This subsection also contains 1 TNC preserve, covering 210 acres (Shawnee Tables 6, 7a):

- Gibbons Creek Barren TNC Natural Area.

Thus, 1,236 acres (0.3%) of the subsection is protected by RNAs and RNA-equivalents (Shawnee Table 7a).

Natural Communities (Alliances)

Of 13 alliances reported to be on national forest land in Subsection 222Dh, 8 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Shawnee Table 5, column 222Dh; Shawnee Table 7b; Shawnee Figure 4).

Of 3 matrix alliances, 2 are represented; 4 of 5 large patch alliances are represented; and of the 5 small patch alliances, 2 are represented. The unrepresented matrix alliance has a low-quality occurrence on a research natural area due to its small size:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance (Panther Hollow RNA).

Lesser Shawnee Hills (Subsection 222Di)

Subsection 222Di contains 3 RNAs, together covering 283 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Barker Bluff RNA (60)
- Burke Branch RNA (206)
- Whoopie Cat Mountain RNA (17)

and 3 Illinois Nature Preserves, together covering 1,948 acres:

- Cave Creek Glade Nature Preserve (25)
- Deer Pond Nature Preserve (62)
- Heron Pond-Little Black Slough Nature Preserve (1,861).

Thus, 2,231 acres (0.5%) of the subsection are protected by RNAs and RNA-equivalents (Shawnee Table 7a).

Natural Communities (Alliances)

Of 15 alliances reported to be on national forest land in Subsection 222Di, 8 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Shawnee Table 5, column 222Di; Shawnee Table 7b; Shawnee Figure 4).

All 3 matrix alliances are represented, 3 of 7 large patch alliances are represented, and 2 of the 5 small patch alliances are represented. Two unrepresented alliances have low-quality occurrences on an RNA and RNA-equivalent:

- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (large patch—Deer Pond Nature Preserve)
- Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance (small patch—Burke Branch RNA).

Cretaceous Hills (Subsection 222Ca)

Subsection 222Ca contains no RNAs or RNA-equivalents (Shawnee Figure 3, Shawnee Tables 6, 7a). Therefore, the 2 matrix alliances, 4 large patch alliances, and 2 small patch alliances in the subsection are unrepresented (Shawnee Table 7b, Shawnee Figure 4).

Illinois Ozarks (Subsection 222Aq)

Subsection 222Aq contains 2 RNAs, together covering 2,060 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Atwood Ridge RNA (955) and
- a portion (1,105 acres) of LaRue-Pine Hills/Otter Pond RNA.

The subsection also contains 5 Illinois Nature Preserves, together covering 779 acres:

- Berryville Shale Glade Nature Preserve (41)
- Brown Barrens Nature Preserve (29)
- a portion (528 acres) of Fults Hill Prairie--Kidd Lake Marsh Nature Preserve
- McClure Shale Glade Nature Preserve (61)
- Stemler Cave Woods Nature Preserve (120)

and 2 Nature Conservancy preserves, together covering 95 acres:

- Swaine Hollow (89)
- E. Dora Bohm Memorial Nature Preserve (6).

Thus, 2934 acres (0.5%) of the subsection are protected by RNAs and RNA-equivalents (Shawnee Table 7a).

Natural Communities (Alliances)

All of the 14 alliances reported to be on national forest land in Subsection 222Aq are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA or RNA-equivalent (Shawnee Table 5, column 222Aq; Shawnee Table 7b; Shawnee Figure 4).

Ohio & Cache River Alluvial Plain (Subsection 222Ch)

Subsection 222Ch contains no RNAs, but does contain 2 Illinois Nature Preserves, together covering 3,298 acres Shawnee Figure 3, Shawnee Tables 6, 7a):

- Section 8 Woods Nature Preserve (327)
- Massac Forest Nature Preserve (267)

And 1 preserve of The Nature Conservancy, covering 205 acres:

- Round Pond (205).

Thus, 799 acres (0.2%) of the subsection are protected by RNA-equivalents (Shawnee Table 7a).

Natural Communities (Alliances)

Of 7 alliances reported to be on national forest land in Subsection 222Ch, 3 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Shawnee Table 5, column 222Ch; Shawnee Table 7b; Shawnee Figure 4).

Of 2 matrix alliances, 1 is represented; of 3 large patch alliances, 1 is represented, and of 2 small patch alliances, 1 is represented. One unrepresented large patch alliance has a low-quality occurrence on a RNA-equivalent:

- Water Tupelo - (Bald Cypress) Semipermanently Flooded Forest Alliance (Round Pond).

The Little Bluestem - Indian Grass - Three-Awn Grass - Polypremum Herbaceous Vegetation (a sand prairie type), historically may have occurred in Subsection 222Ch, and possibly on the Forest, but is no longer known to occur. Therefore it is not a realistic ecosystem to represent for the Shawnee National Forest. However, if an example of this community is discovered, it would be a high priority to protect.

Mississippi River Alluvial Plain (Subsection 222Ao)

Subsection 222Ao contains 2 RNAs, together covering 2,015 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- a portion (1,480 acres) of LaRue-Pine Hills/Otter Pond RNA and
- Ozark Hill Prairie RNA (535).

The subsection also contains 1 Illinois Nature Preserve:

- a portion (264 acres) of Fults Hill Prairie--Kidd Lake Marsh Nature Preserve

and 3 Missouri Designated Natural Areas, together covering 2,725 acres:

- Pelican Island Designated Natural Area* (2,260)
- Schnabel Woods Designated Natural Area (80)
- Weldon Spring Hollow Designated Natural Area* (385).

* No community data are available at this time.

Thus, 5,004 acres (1%) of the subsection are protected by RNAs and RNA-equivalents (Shawnee Table 7a).

Natural Communities (Alliances)

Of 13 alliances reported to be on national forest land in Subsection 222Ao, 10 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA (Shawnee Table 5, column 222Ao; Shawnee Table 7b; Shawnee Figure 4). Of 4 matrix alliances, 3 are represented; 6 of 7 large patch alliances are represented; and 1 of 2 small patch alliances are represented.

Lower Ohio-Cache-Wabash Alluvial Plain (Subsection 222Db)

Subsection 222Db contains no RNAs or known RNA-equivalents (Shawnee Figure 3, Shawnee Tables 6, 7a). No alliances have been identified on national forest land, because until recently it was treated as part of Subsection 222Gc (see Methods Section). Therefore this subsection cannot be evaluated at this time.

Lower Wabash Alluvial Plain (Subsection 222Gc)

Subsection 222Gc contains no RNAs, but does contain 2 Illinois Nature Preserves, together covering 488 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Beall Woods Nature Preserve (333)
- Chauncey Marsh Nature Preserve (155).

These preserves protect 0.04% of the subsection. (Shawnee Table 7a)

Natural Communities (Alliances)

None of the 4 matrix, 3 large patch, and 2 small patch alliances reported to be on national forest land in Subsection 222Gc is represented (Shawnee Table 5, column 222Gc; Shawnee Table 7b; Shawnee Figure 4). One large patch alliance has a low-quality occurrence on a RNA-equivalent:

- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (Chauncey Marsh Nature Preserve).

It is likely that additional alliances occur on national forest land in this subsection.

Mount Vernon Hill Country (Subsection 222Gb)

Subsection 222Gb contains no RNAs, but does contain 5 Illinois Nature Preserves, together covering 134 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Lake Murphysboro State Park Prairie (1)
- Marissa Woods Nature Preserve (25)
- Miller Shrub Swamp Nature Preserve (36)
- Posen Woods Nature Preserve (40)
- Red Hills Woods Nature Preserve (32)

These preserves protect 0.004% of the subsection.

Natural Communities (Alliances)

Two alliances have been identified on national forest land in this subsection (Shawnee Table 7b, Shawnee Figure 4). Neither is represented. It is likely that additional alliances occur on national forest land in this subsection.

North Mississippi River Alluvial Plain (Subsection 234An)

Subsection 234An contains no RNAs, but does contain 1 Illinois Nature Preserve covering 492 acres (Shawnee Figure 3, Shawnee Tables 6, 7a):

- Horseshoe Lake Nature Preserve (492).

This preserve protects 0.006 percent of the subsection.

Natural Communities (Alliances)

No alliances have been identified on national forest land, because until recently Subsection 234An was treated as part of Subsection 222Ch (see Methods). Therefore this subsection cannot be evaluated at this time.

IX.K.3.d. Synthesis: needs for ecosystem representation

The following table summarizes representation of alliances by subsections for the Shawnee. It also shows our suggested priority ranking of the subsections based on prominence and the representation of biological variation (percentage of alliances represented). The percentage of national forest land and percentage of acres represented in each subsection was not used to prioritize the subsections, though the RNA Committee on the Shawnee National Forest may choose to do so. The reasoning behind the priority ranks given in this table is described below.

The *complete* list of needs is shown in Shawnee Table 5 by shaded cells that contain no number. Alliances that are not represented in any Shawnee National Forest subsection (unrepresented Forest-wide) are listed in Shawnee Appendix C.

Subsection	Dominance Percentage Shawnee NF land in the subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Shawnee NF lands	Percentage of NF alliances represented	Proposed priority
Cretaceous Hills (222Ca)	4	0	6	0	high
Greater Shawnee Hills (222Dh)	46	0.3	27	62	high
Lesser Shawnee Hills (222Di)	23	0.5	15	53	high
Ohio and Cache River Alluvial Plain (222Ch)	4	0.2	3	43	low
Mississippi River Alluvial Plain (222Ao)	5	1	3	77	low
Lower Ohio-Cache-Wabash Alluvial Plain (222Db)	3	0	1	*unknown*	low
Lower Wabash Alluvial Plain (222Gc)	1	0.04	0.2	0 *(?)*	low
Mount Vernon Hill Country (222Gb)	3	0.004	0.2	0 *(?)*	low
North Mississippi River Alluvial Plain (234An)	0.4	0.006	0.01	*unknown*	low
Illinois Ozarks (222Aq)	11	0.5	6	100	low

Based on prominence alone, the high-priority subsections would be 222Dh (27%) and 222Di (15%), and medium priority subsections would be 222Aq (6%) and 222Ca (6%). (The remaining subsections would be low-priority; each has a prominence of 3% or less.) The priority scheme would be similar based on dominance (percentage of Shawnee NF in the subsection), except that 222Ao, 222Ch, 222Db, and 222Gb would also be medium priority.

When representation of biological variation is considered in addition to prominence, the Cretaceous Hills (222Ca) is highest priority for representation; currently none of the alliances in this subsection are represented. The Greater Shawnee Hills (222Dh) and Lesser Shawnee Hills (222Di) are high priority for additional representation due to their especially high prominence. The Illinois Ozarks (222Aq) is low priority because all identified alliances are already represented; however it should be verified that all alliances have been identified.

The remaining subsections are low priority under this scheme. The Shawnee has low prominence (about 3%) in the Ohio and Cache River Alluvial Plain (222Ch) and the Mississippi River Alluvial Plain (222Ao), and over 40% of the alliances identified in these subsections are represented. The Shawnee has a prominence of 1% or less in all of the remaining subsections, and as a result they are also low priority. However, they should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

Cretaceous Hills (Subsection 222Ca)

None of the 8 alliances are represented (Shawnee Figure 4). The 2 matrix alliances may be the highest priority for RNA establishment:

- American Beech - Sugar Maple (Tuliptree) Forest Alliance
- Black Oak - White Oak Forest Alliance.

Greater Shawnee Hills (Subsection 222Dh)

Of 13 alliances in this subsection 8 are represented, leaving 38% in need of representation (Shawnee Figure 4). The 1 unrepresented matrix alliance may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance.

This alliance has a low quality occurrence in Panther Hollow RNA (Shawnee Table 7b, Shawnee Appendix B). The quality/viability of this occurrence should be verified.

Lesser Shawnee Hills (Subsection 222Di)

Of 15 alliances in this subsection 8 are represented, leaving 47% in need of representation (Shawnee Figure 4). All 3 matrix alliances are already represented.

Ohio & Cache River Alluvial Plain (Subsection 222Ch)

Of 7 alliances in this subsection 3 are represented, leaving 57% in need of representation (Shawnee Figure 4). The 1 unrepresented matrix alliance may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance.

Mississippi River Alluvial Plain (Subsection 222Ao)

Of 13 alliances in this subsection 10 are represented, leaving 23% in need of representation (Shawnee Figure 4). The 1 unrepresented matrix alliance may be the highest priority for RNA establishment:

- Bald-cypress Semi-permanently Flooded Forest Alliance.

Lower Ohio-Cache-Wabash Alluvial Plain (Subsection 222Db)

Alliances occurring on national forest land have yet to be identified for this subsection.

Lower Wabash Alluvial Plain (Subsection 222Gc)

None of the 7 alliances in this subsection are represented (Shawnee Figure 4). The 1 unrepresented matrix alliance may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance.

Further work is needed to determine the complete list of alliances on national forest land in this subsection.

Mount Vernon Hill Country (Subsection 222Gb)

Neither of the two alliances identified on the estimated 6,527 acres of Shawnee land in this subsection are represented. The 1 matrix alliance may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance.

Further work is needed to determine the complete list of alliances on national forest land in this subsection.

North Mississippi River Alluvial Plain (Subsection 234An)

Alliances have yet to be identified on the national forest land in this subsection.

Illinois Ozarks (Subsection 222Aq)

All of the 14 alliances in this subsection are already represented in at least one RNA or RNA-equivalent. Therefore representation may be complete in this subsection. However, the list of ecosystems to represent for this subsection should be reviewed to verify that alliances have been identified.

SHAWNEE TABLES

Shawnee Table 1. Established research natural areas (RNAs) of the Shawnee National Forest

RNA	Acres	Subsection	Established
Atwood Ridge RNA	955	222Aq	1990
Barker Bluff RNA	60	222Di	1990
Burke Branch RNA	206	222Di	1991
Cave Hill RNA	465	222Dh	1990
Dennison Hollow RNA	205	222Dh	1989
LaRue-Pine Hills/ Otter Pond RNA	2,585	222Aq & 222Ao	1991
Ozark Hill Prairie RNA	535	222Ao	1991
Panther Hollow RNA	180	222Dh	1989
Stoneface RNA	176	222Dh	1990
Whoopie Cat Mountain RNA	17	222Di	1990

Shawnee Table 2. Designations identified to date as RNA-equivalents for the Shawnee National Forest

Protected area designation	Managed by
Illinois State Nature Preserves	Illinois Department of Conservation
Missouri State Natural Areas*	Missouri Department of Conservation
preserves of The Nature Conservancy	The Nature Conservancy (private)

*Some subsections of the Shawnee NF occur in both Illinois and Missouri, so RNA-equivalents in both states are relevant.

Shawnee Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Shawnee National Forest

The Shawnee may work with these organizations to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Ecological Areas*, Special Areas, Wilderness Areas	USDA Forest Service (Shawnee National Forest)
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities

* Shawnee National Forest Ecological Areas are listed in Shawnee Appendix D, along with some alliance-subsection data.

Shawnee Table 4. Subsections of the Shawnee National Forest, in order of prominence
"NF acres" is the number of acres of national forest land (ownership) in the subsection. "Prominence" is the percentage of the subsection on Shawnee National Forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Shawnee total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Shawnee Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF land in subsection
222Dh—Greater Shawnee Hills	465,505	127,622	27	46
222Di—Lesser Shawnee Hills	482,115	74,188	15	23
222Ca—Cretaceous Hills	190,165	11,798	6	4
222Aq—Illinois Ozarks	550,729	30,360	6	11
222Ch—Ohio and Cache River Alluvial Plain	348,147	10,350	3	4
222Ao—Mississippi River Alluvial Plain	480,356	13,396	3	5
222Db—Lower Ohio-Cache-Wabash Alluvial Plains	739,657	7,811	1	3
222Gc—Lower Wabash Alluvial Plain	1,399,063	3,271	0.2	1
222Gb—Mount Vernon Hill Country	3,417,838	7,578	0.2	3
234An—North Mississippi River Alluvial Plain	8,680,267	1,129	0.01	0.4
Shawnee total ownership:		277,496		

Shawnee Table 5. Subsections and alliances of the Shawnee National Forest (NF) and their representation by RNAs and RNA-equivalents.

Alliances are grouped by their community pattern (matrix, large patch, and small patch) and subsections are sorted by National Forest prominence (see Shawnee Table 4, fourth column). The presence of an alliance in a subsection and on National Forest land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) GSH= Greater Shawnee Hills, LSH= Lesser Shawnee Hills, CH= Cretaceous Hills, IO= Illinois Ozarks, OC= Ohio and Cache River Alluvial Plain, MR= Mississippi River Alluvial Plain, LO= Lower Ohio-Cache-Wabash Alluvial plains, LW= Lower Wabash Alluvial Plain, MV= Mount Vernon Hill Country, NM= North Mississippi River Alluvial Plain. For a list of alliances occurring in subsections of the Shawnee NF subsections but not reported on NF land, see Shawnee Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Shawnee NF--

Community Pattern **Alliances Reported on NF Land**	222Dh (GSH)		222Dl (LSH)		222Ca (CH)		222Aq (IO)		222Ch (OC)		222Ao (MR)		222Db* (LO)		222Gc§ (LW)		222Gb§ (MV)		234An* (NM)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	▪	1	(1) ▪		▪		2 (1) ▪		▪		1	▪	▪		▪		▪		▪	(1)
Black Oak - White Oak Forest Alliance	4 (1) ▪		1	2 ▪(1)	▪		2 (2) ▪	(2)			1	▪						▪(1)		
White Oak - (Red Oak, Hickory species) Forest Alliance	2 ▪	2	(1) ▪	1			1 (3) ▪	(2)	▪		1	▪	▪		(1) ▪			▪(2)		
Bald-cypress Semipermanently Flooded Forest Alliance			(1)	▪(1)	▪				(2) ▪			▪	▪		▪				(1) ▪	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance							1 ▪													
Post Oak - Blackjack Oak Forest Alliance	4 ▪		2	▪	▪		1 (1) ▪	(3)	▪											
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	1 ▪						1 ▪						▪							
White Oak - (Southern Red Oak, Post Oak) Forest Alliance			1	▪	▪				▫											
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance			1 (1) ▪		▪				(1) ▪		1	▪	▪		(1) ▪				(1) ▪	

* We were unable to obtain data about alliances on national forest land in these subsections. We have almost no community data for Subsection 234An.

§ Community data are likely incomplete for these subsections.

--Subsections of Shawnee NF--

Community Pattern **Alliances Reported on NF Land**	222Dh (GSH)	222Di (LSH)	222Ca (CH)	222Aq (IO)	222Ch (OC)	222Ao (MR)	222Db* (LO)	222Gc§ (LW)	222Gb§ (MV)	234An* (NM)
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance		▪				1 ▪				▪
Overcup Oak - (Water Hickory) Seasonally Flooded Forest Alliance		(1) ▪			(1) ▪		▪			▪
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		▪ (1)			(1) ▪ (2)	1 ▪	▪	▪ (1)	▪	(1) ▪
Red Maple - Green Ash Seasonally Flooded Forest Alliance						1 ▪	▪			
Silver Maple Temporarily Flooded Forest Alliance				▪	▪		▪	▪	▪	▪
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	▪	▪		1 ▪		▪			▪	
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance					▪ (1)			▪		
Post Oak - Blackjack Oak Woodland Alliance	3 ▪	▪	▪	2 ▪	▪		▫	▪	▪	
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance		▪ (1)	▪	1 ▪		1 ▪			▪	
Little Bluestem - Indian Grass Herbaceous Alliance	1 1 ▪		▫	2 (1) ▪		1 ▪			(1) ▪	

Small Patch Alliances **Rank:**	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	3 (1) ▪		▪	1	▪		1 (1) ▪				▪							
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance	3 ▪		▪				(2) ▪											
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance	▪		2 (2) ▪				1 (1) ▪											
Buttonbush Semipermanently Flooded Shrubland Alliance	▪		(1) ▪				▪		(1) ▪		1 ▪		▪		▪		(1) ▪	
Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance	▪				▪		▫						▫		▪			
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance									▪		▪				▪			
Open Bluff/Cliff Sparse Vegetation	▪		▪				(1) ▪								▪		▪	

* We were unable to obtain data about alliances on national forest land in these subsections. We have almost no community data for Subsection 234An.
§ Community data are likely incomplete for these subsections.

Shawnee Table 6. RNAs and RNA-equivalents of the Shawnee National Forest
Size, in acres, of each RNA or RNA-equivalent follows the name in parentheses. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA. For the Shawnee, all non-Forest Service RNA-equivalents are Illinois Nature Preserves, Missouri Designated Natural Areas, and preserves of The Nature Conservancy.

Sub-section	RNA (acres)	RNA-equivalent (acres)	
		Illinois Nature Preserves and Missouri* Natural Areas	TNC Preserve
222Dh	• Cave Hill RNA (465) • Dennison Hollow RNA (205) • Panther Hollow RNA (180) • Stoneface RNA (176)		• Gibbons Creek Barren TNC Natural Area (210)
222Di	• Barker Bluff RNA (60) • Burke Branch RNA (206) • Whoopie Cat Mountain RNA (17)	• Cave Creek Glade Nature Preserve (25) • Deer Pond Nature Preserve (62) • Heron Pond-Little Black Slough Nature Preserve (1861)	
222Ca			
222Aq	• Atwood Ridge RNA (955) • LaRue-Pine Hills/Otter Pond RNA (1,105)	• Berryville Shale Glade Nature Preserve (41) • Brown Barrens Nature Preserve (29) • Fults Hill Prairie—Kidd Lake Marsh Nature Preserve (528) • McClure Shale Glade Nature Preserve (61) • Stemler Cave Woods Nature Preserve (120)	• Swaine Hollow (89) • Dora Bohm Memorial Nature Preserve (6)
222Ch		• Section 8 Woods Nature Preserve (327) • Massac Forest Nature Preserve (267)	• Round Pond (205)
222Ao	• LaRue-Pine Hills/Otter Pond RNA (1,480) • Ozark Hill Prairie (535)	• Fults Hill Prairie—Kidd Lake Marsh Nature Preserve (264) • Pelican Island Designated Natural Area*§ (2,260) • Schnabel Woods Designated Natural Area* (80) • Weldon Spring Hollow Designated Natural Area*§ (385)	
222Db			
222Gc		• Beall Woods Nature Preserve (333) • Chauncey Marsh Nature Preserve (155)	
222Gb		• Lake Murphysboro State Park Prairie (1) • Marissa Woods Nature Preserve (25) • Miller Shrub Swamp Nature Preserve (36) • Posen Woods Nature Preserve (40) • Red Hills Woods Nature Preserve (32)	
234An		• Horseshoe Lake Nature Preserve (492)	

* Missouri Natural Areas
§ No community data available

Shawnee Table 7. Summary of subsection representation on the Shawnee National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
222Dh. Greater Shawnee Hills	4	1	1,026	210	1,236 *<1%*
222Di. Lesser Shawnee Hills	3	3	283	1,948	2,231 *<1%*
222Ca. Cretaceous Hills		0			0
222Aq. Illinois Ozarks	2	7	2,060	874	2,934 *<1%*
222Ch. Ohio and Cache River Alluvial Plain		3		799	799 *<1%*
222Ao. Mississippi River Alluvial Plain	2	4	2,015	2,989	5,004 *1%*
222Db. Lower Ohio-Cache-Wabash Alluvial Plains		0			0
222Gc. Lower Wabash Alluvial Plain		2		488	488 *<1%*
222Gb. Mount Vernon Hill Country		5		134	134 *<1%*
234An. North Mississippi River Alluvial Plain		1		492	492 *<1%*
TOTAL	11	26	5,384	7,934	13,318 *<1%*

* There are 10 RNAs and 25 RNA-equivalents, but the LaRue-Pine Hills/Otter Pond RNA and Fults Hill Prairie--Kidd Lake Marsh Nature Preserve are both shared by Subsections 222Aq and 222Ao.

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *?* = unknown.

Subsection	# Alliances on NF land	Alliance representation			Low-quality*
		RNA	RNA-eq	Total**	
222Dh. Greater Shawnee Hills	13	8 *62%*	2 *15%*	8 *62%*	1
222Di. Lesser Shawnee Hills	15	5 *33%*	5 *33%*	8 *53%*	2
222Ca. Cretaceous Hills	8			0	
222Aq. Illinois Ozarks	14	11 *79%*	9 *64%*	14 *100%*	
222Ch. Ohio and Cache River Alluvial Plain	7		3 *43%*	3 *43%*	1
222Ao. Mississippi River Alluvial Plain	13	10 *77%*		10 *77%*	
222Db. Lower Ohio-Cache-Wabash Alluvial Plains	*?*			*?*	
222Gc. Lower Wabash Alluvial Plain	7 *(+)*			0	1
222Gb. Mount Vernon Hill Country	2 *(+)*			0 *(?)*	
234An. North Mississippi River Alluvial Plain	*?*			*?*	

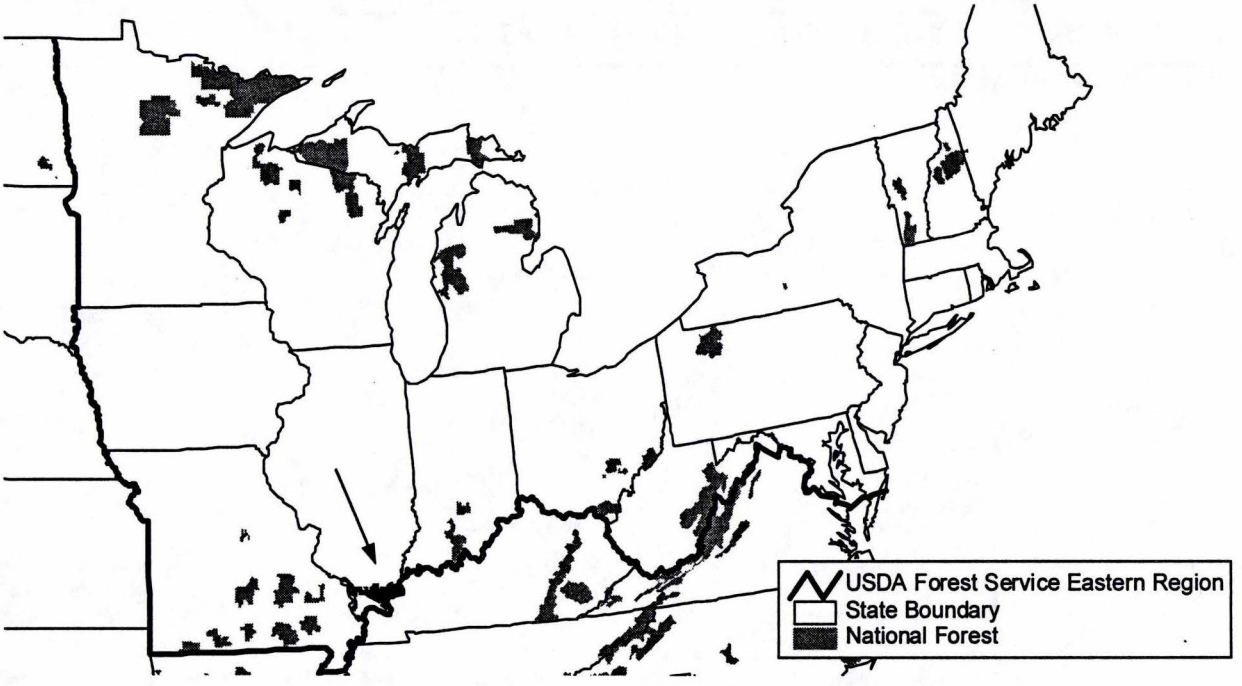
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Shawnee Table 8. Alliances of the Shawnee National Forest arranged by community pattern and community distribution

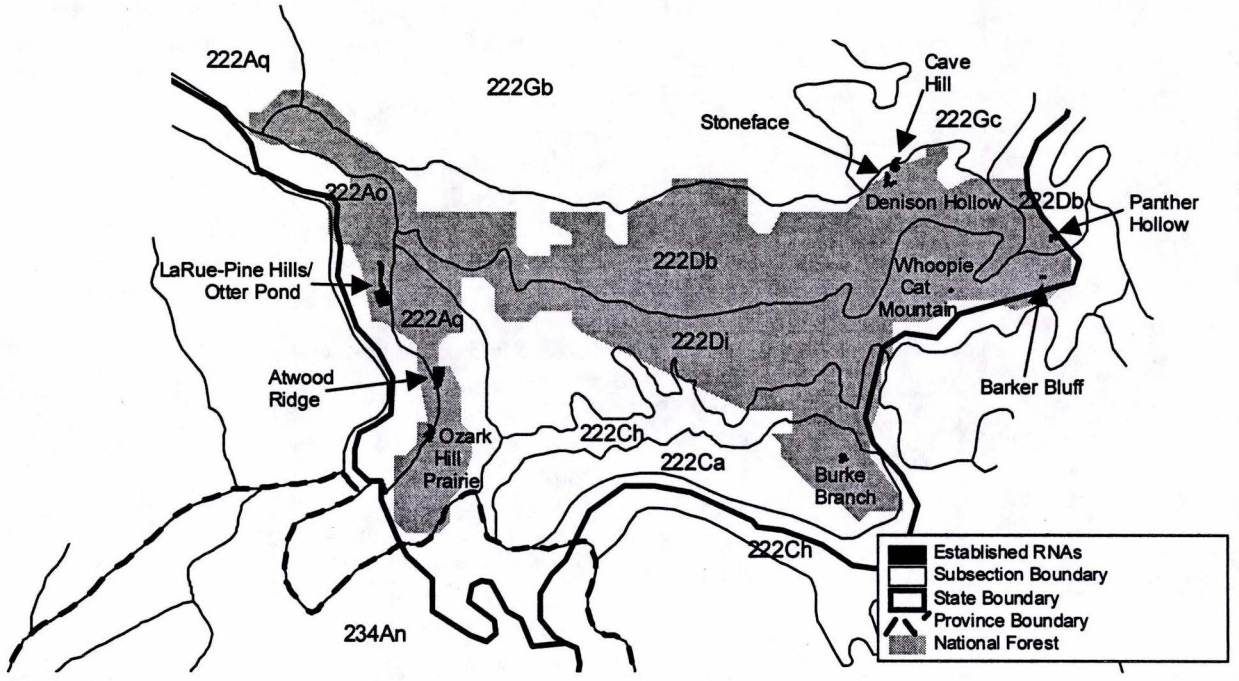
COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC			• Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous
LIMITED	• American Beech - Sugar Maple - (Tuliptree) Forest	• White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland • Post Oak - Blackjack Oak Woodland • Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest • Sugar Maple - Bitternut Hickory Temporarily Flooded Forest	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous • Little Bluestem - Side-oats Grama Evergreen or Mixed Wooded Herbaceous
WIDESPREAD	• Bald-cypress Semipermanently Flooded Forest • Black Oak - White Oak Forest • White Oak - (Red Oak, Hickory species) Forest	• Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest • Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest • Little Bluestem - Indian Grass Herbaceous • (Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest • Pin Oak - (Swamp White Oak) Seasonally Flooded Forest • Post Oak - Blackjack Oak Forest • Red Maple - Green Ash Seasonally Flooded Forest • Silver Maple Temporarily Flooded Forest • Water Tupelo - (Bald Cypress) Semipermanently Flooded Forest • White Oak - Oak (Southern Red, Post) Forest	• Buttonbush Semipermanently Flooded Shrubland • Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous • Open Bluff/Cliff Sparse Vegetation • Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous
PERIPHERAL		• Overcup Oak - (Water Hickory) Seasonally Flooded Forest	

SHAWNEE FIGURES

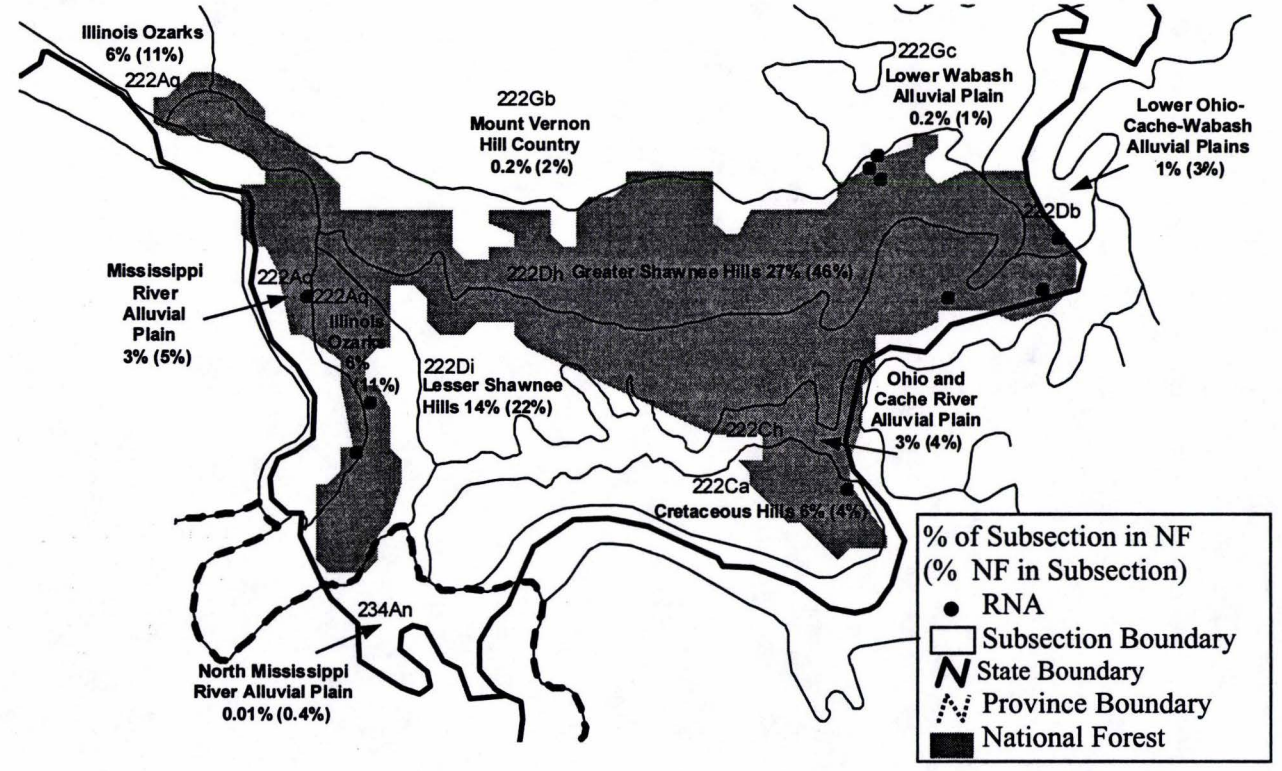
Shawnee Figure 1. Location of the Shawnee National Forest.



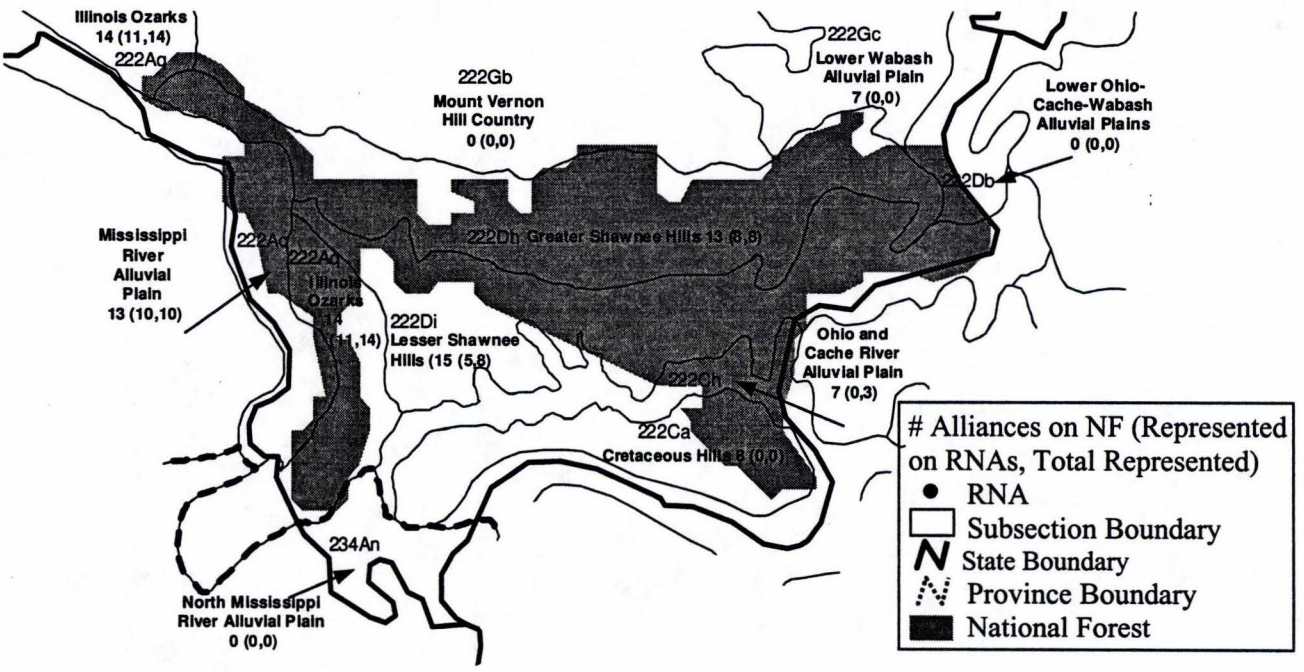
Shawnee Figure 2. The Shawnee National Forest with established RNAs and subsections.
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Shawnee Figure 3. Shawnee National Forest in relation to subsections.
The entire national forest is shaded, but not all land in the shaded area is managed by the national forest. In each subsection, the percent of the subsection *managed* by the national forest (*prominence)* is shown, followed (in parentheses) by the percent of national forest land (managed) in the subsection.



Shawnee Figure 4. Alliance representation on subsections of the Shawnee National Forest.
The entire Shawnee National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the number of alliances occurring on national forest land is shown, and, in parentheses, the number of these represented by RNAs, followed by the total number represented by both RNAs and RNA-equivalents.



Shawnee Appendix A. Subsections of the Shawnee National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Shawnee Table 5 for information on the format of this table. The difference between these two tables is that Shawnee Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Shawnee Table 5, i.e. to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Maybe on NF land	▫ Maybe in subsection	(3)	(2)	RNA-equivalent

--Subsections of Shawnee NF--

Community Pattern **Alliances not Reported on NF Land**	222Dh (GSH)		222Dl (LSH)		222Ca (CH)		222Aq (IO)		222Ch (OC)		222Ao (MR)		222Db (LO)		222Gc (LW)		222Gb (MV)		234An* (NM)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Bur Oak - (White Oak) Wooded Herbaceous Alliance																	▪			
Big Bluestem - (Indian Grass) Herbaceous Alliance												▪						▪		
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Post Oak Flatwoods Forest Alliance														▪		▪	(2)	▪		
Red Oak - Sugar Maple - (White Oak) Forest Alliance							(1)	▪												
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		▪									(1)	▪		▪						
American Beech Temporarily Flooded Forest Alliance														▪		▪				
Bur Oak - Swamp White Oak - (Big Shellbark Hickory) Temporarily Flooded Forest Alliance																		▪		
River Birch - (Sycamore) Temporarily Flooded Forest Alliance						▫				▫										
Red Maple - Black Gum Saturated Forest Alliance						▫														
Chinquapin Oak Woodland Alliance												▪								

* Community data are incomplete

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Shawnee NF-- 222Dh (GSH)	222Di (LSH)	222Ca (CH)	222Aq (IO)	222Ch (OC)	222Ao (MR)	222Db (LO)	222Gc (LW)	222Gb (MV)	234An* (NM)
Bald-cypress Semipermanently Flooded Woodland Alliance					▪		▪			▪
Big Bluestem - (Canada Bluejoint, Switchgrass) Herbaceous Alliance						▪			▪	
Prairie Cordgrass Temporarily Flooded Herbaceous Alliance					▪					
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance						(1) ▪	▪		▪	
River Bulrush Seasonally Flooded Herbaceous Alliance								(1) ▪		

Small Patch Alliances Rank:	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C	AB	C
Switchgrass Temporarily Flooded Herbaceous Alliance													▪							
American Lotus Semipermanently Flooded Herbaceous Alliance									▪				▪						▪	
Knotweed - Mixed Forbs Temporarily Flooded Herbaceous Alliance															▪					
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance									▪				▪						▪	
Skunk Cabbage - Marsh Marigold Saturated Herbaceous Alliance															▪					
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance									▪				▪						▪	
White Waterlily Permanently Flooded Temperate Herbaceous Alliance													▪							
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance															▫					
Lowland Talus Sparse Vegetation																	▪			

* Community data are incomplete

Shawnee Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Shawnee National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection* 222Dh. *Greater Shawnee Hills								
Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Panther Hollow		20	D	AB	B	BC	
Black Oak - White Oak Forest Alliance	Cave Hill		160	C	AB	B	B	
	Dennison Hollow		88	C	AB	B	B	
	Panther Hollow		60	C	AB	B	B	
	Stoneface		55	C	AB	B	B	
		Gibbons Creek Barren TNC Natural Area	205	B	BC	BC	B	
White Oak - (Red Oak, Hickory species) Forest Alliance	Cave Hill		135	C	AB	B	B	
	Dennison Hollow		50	C	AB	B	B	
	Panther Hollow		30	D	AB	B	BC	
	Stoneface		30	D	AB	B	BC	
Large Patch Alliances								
Post Oak - Blackjack Oak Forest Alliance	Cave Hill		110	B	AB	B	B	
	Dennison Hollow		17	C	AB	B	B	
	Panther Hollow		40	C	AB	B	B	
	Stoneface		51	B	AB	B	B	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	Dennison Hollow		15	C	AB	B	B	
Post Oak - Blackjack Oak Woodland Alliance	Cave Hill		15	C	AB	B	B	
	Dennison Hollow		10	C	AB	B	B	
	Stoneface		20	C	AB	B	B	
Little Bluestem - Indian Grass Herbaceous Alliance	Cave Hill		10	C	AB	B	B	
	Stoneface		3	D	AB	B	BC	
Small Patch Alliances								
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	Cave Hill		20	B	AB	B	B	
	Dennison Hollow		10	B	AB	B	B	
	Stoneface		12	B	AB	B	B	
		Gibbons Creek Barren TNC Natural Area	5	BC	AB	BC	B	
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance	Cave Hill		15	B	AB	B	B	
	Dennison Hollow		15	B	AB	B	B	
	Stoneface		5	B	AB	B	B	
		Greater Shawnee Hills (222Dh) Total:	1,206					

Community Pattern / Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Subsection 222Di. Lesser Shawnee Hills					
Matrix Alliances					
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Heron Pond-Little Black Slough Nature Preserve	711	B AD B	B
Black Oak - White Oak Forest Alliance	Barker Bluff		12	D AB B	BC
	Burke Branch		63	C AB B	B
	Whoopie Cat Mountain		14	D AB B	BC
		Cave Creek Glade Nature Preserve	16	C BC BC	BC
White Oak - (Red Oak, Hickory species) Forest Alliance	Barker Bluff		15	D AB B	BC
		Heron Pond-Little Black Slough Nature Preserve	1,189	B AD B	AB
Bald-cypress Semipermanently Flooded Forest Alliance		Deer Pond Nature Preserve	34	D? A BC	BC
		Heron Pond-Little Black Slough Nature Preserve	1,592	B AC B	AB
Large Patch Alliances					
Post Oak - Blackjack Oak Forest Alliance	Barker Bluff		25	C AB B	B
	Burke Branch		20	C AB B	B
White Oak - (Southern Red Oak, Post Oak) Forest Alliance	Burke Branch		70	B AB B	B
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance	Burke Branch		50	B AB B	B
		Heron Pond-Little Black Slough Nature Preserve	823	A BC B	B
Overcup Oak - (Water Hickory) Seasonally Flooded Forest Alliance		Heron Pond-Little Black Slough Nature Preserve	1,049	A BD B	B
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Deer Pond Nature Preserve	28	C BC BC	BC
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance		Cave Creek Glade Nature Preserve	5	CD BC BC	BC
Small Patch Alliances					
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	Burke Branch		3	D AB B	BC
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance	Barker Bluff		8	B AB B	B
	Whoopie Cat Mountain		3	C AB B	B
		Cave Creek Glade Nature Preserve	4	C A BC	B
		Heron Pond-Little Black Slough Nature Preserve	5	B A B	AB
Buttonbush Semipermanently Flooded Shrubland Alliance		Heron Pond-Little Black Slough Nature Preserve	130	A B B	AB
		Lesser Shawnee Hills (222Di) Total:	5,869		
Subsection 222Ca. Cretaceous Hills					
		Cretaceous Hills (222Ca) Total:			

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 222Aq. Illinois Ozarks								
Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Atwood Ridge		60	C	AB	B	B	
	LaRue-Pine Hills/Otter Pond (Aq)		100	C	AB	B	B	
		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Aq)	77	C	B	BC	B	
Black Oak - White Oak Forest Alliance	Atwood Ridge		420	BC	AB	B	B	
	LaRue-Pine Hills/Otter Pond (Aq)		100	C	AB	B	B	
		Berryville Shale Glade Nature Preserve	20	CD	C	B	BC	
		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Aq)	76	B	B	BC	B	
		Mcclure Shale Glade Nature Preserve	3	D	C	BC	BC	
		Stemler Cave Woods Nature Preserve	157	B	AC	BC	B	
White Oak - (Red Oak, Hickory species) Forest Alliance	LaRue-Pine Hills/Otter Pond (Aq)		300	BC	AB	B	B	
		Brown Barrens Nature Preserve	5	D	C	BC	C	
		E. Dora Bohm Memorial Nature Preserve	25	D	BC	B	C	
		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Aq)	300	C	B	BC	B	
		Stemler Cave Woods Nature Preserve	157	C	AC	BC	B	
		Swaine Hollow	75	C	B	B	B	
Large Patch Alliances								
Shortleaf Pine - (White Oak, Southern Red Oak, Post Oak, Black Oak) Forest Alliance	LaRue-Pine Hills/Otter Pond (Aq)		35	C	AB	B	B	
Post Oak - Blackjack Oak Forest Alliance	LaRue-Pine Hills/Otter Pond (Aq)		200	B	AB	B	B	
		Berryville Shale Glade Nature Preserve	20	C	C	B	C	
		Brown Barrens Nature Preserve	5	D	C	BC	C	
		Mcclure Shale Glade Nature Preserve	3	D	C	BC	C	
		Stemler Cave Woods Nature Preserve	134	BABC		BC	B	
Red Oak - Sugar Maple - (White Oak) Forest Alliance		E. Dora Bohm Memorial Nature Preserve	31	C	A	B	B	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	Atwood Ridge		450	AB	AB	B	AB	
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	LaRue-Pine Hills/Otter Pond (Aq)		200	A	AB	B	AB	
Post Oak - Blackjack Oak Woodland Alliance	Atwood Ridge		12	C	AB	B	B	
	LaRue-Pine Hills/Otter Pond (Aq)		100	B	AB	B	B	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance	LaRue-Pine Hills/Otter Pond (Aq)		20	C AB B	B
Little Bluestem - Indian Grass Herbaceous Alliance	Atwood Ridge		3	D AB B	BC
	LaRue-Pine Hills/Otter Pond (Aq)		1	D AB B	BC
		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Aq)	46	B AB BC	B
Small Patch Alliances					
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	LaRue-Pine Hills/Otter Pond (Aq)		40	B AB B	B
		Brown Barrens Nature Preserve	2	C A BC	B
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance		Berryville Shale Glade Nature Preserve	1	C AB B	AB
		Mcclure Shale Glade Nature Preserve	4	C AB BC	B
Little Bluestem - Sideoats Grama Evergreen or Mixed Wooded Herbaceous Alliance	Atwood Ridge		10	B AB B	B
	LaRue-Pine Hills/Otter Pond (Aq) ?		9	B AB B	QB ?
		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Aq)	29	B AB BC	B
Open Bluff/Cliff Sparse Vegetation		Swaine Hollow	9	C A B	B
		Illinois Ozarks (222Aq) Total:	3,239		

Subsection 222Ch. Ohio and Cache River Alluvial Plain

Matrix Alliances					
Bald-cypress Semipermanently Flooded Forest Alliance		Round Pond	67	B BC BC	B
		Section 8 Woods Nature Preserve	658	B BC B	B
Large Patch Alliances					
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance		Massac Forest Nature Preserve	75	B BD BC	B
Overcup Oak - (Water Hickory) Seasonally Flooded Forest Alliance		Section 8 Woods Nature Preserve		U B B	B
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Massac Forest Nature Preserve	174	B C BC	BC
		Round Pond	100	B BC BC	BC
		Section 8 Woods Nature Preserve		U BC B	B
Water Tupelo - (Bald-cypress) Semipermanently Flooded Forest Alliance		Round Pond	33	C BC BC	BC
Small Patch Alliances					
Buttonbush Semipermanently Flooded Shrubland Alliance		Section 8 Woods Nature Preserve		U BC B	B
		Ohio and Cache River Alluvial Plain (222Ch) Total:	1,107		

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection 222Ao. Mississippi River Alluvial Plain								
Matrix Alliances								
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Ozark Hill Prairie		150	BC	BC	B	B	
Black Oak - White Oak Forest Alliance	Ozark Hill Prairie		209	B	BC	B	B	
White Oak - (Red Oak, Hickory species) Forest Alliance	Ozark Hill Prairie		150	BC	BC	B	B	
Large Patch Alliances								
Sugar Maple - Red Oak - Bitternut Hickory Forest Alliance		Schnabel Woods Designated Natural Area	65	B	B	B	B	
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance	LaRue-Pine Hills/Otter Pond (Ao)		110	B	AB	B	B	
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	LaRue-Pine Hills/Otter Pond (Ao)		570	A	AB	B	AB	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance	LaRue-Pine Hills/Otter Pond (Ao)		200	B	AB	B	B	
Red Maple - Green Ash Seasonally Flooded Forest Alliance	LaRue-Pine Hills/Otter Pond (Ao)		210	A	AB	B	AB	
White Oak - Post Oak - Black Oak - (Southern Red Oak) Woodland Alliance	Ozark Hill Prairie		20	C	BC	B	B	
Little Bluestem - Indian Grass Herbaceous Alliance	Ozark Hill Prairie		6	B	A	B	B	
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance		Fults Hill Prairie--Kidd Lake Marsh Nature Preserve (Ao)	264	B	BC	BC	B	
Small Patch Alliances								
Buttonbush Semipermanently Flooded Shrubland Alliance	LaRue-Pine Hills/Otter Pond (Ao)		390	B	AB	B	B	
		Mississippi River Alluvial Plain (222Ao) Total:	2,344					
Subsection 222Db. Lower Ohio-Cache-Wabash Alluvial plains								
		Lower Ohio-Cache-Wabash Alluvial plains (222Db) Total:						
Subsection 222Gc. Lower Wabash Alluvial Plain								
Matrix Alliances								
White Oak - (Red Oak, Hickory species) Forest Alliance		Beall Woods Nature Preserve	118	C	ABC	BC	B	
Large Patch Alliances								
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance		Beall Woods Nature Preserve	199	B	AB	BC	B	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Chauncey Marsh Nature Preserve	40	C	BC	BC	BC	
River Bulrush Seasonally Flooded Herbaceous Alliance		Chauncey Marsh Nature Preserve	115	B	BC	BC	B	
		Lower Wabash Alluvial Plain (222Gc) Total:	472					
Subsection 222Gb. Mount Vernon Hill Country								
Matrix Alliances								
Black Oak - White Oak Forest Alliance		Red Hills Woods Nature Preserve	26	C	B	BC	BC	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
White Oak - (Red Oak, Hickory species) Forest Alliance		Marissa Woods Nature Preserve	5	D	A	BC	C	
		Posen Woods Nature Preserve	14	D	A	BC	BC	
Large Patch Alliances								
Post Oak Flatwoods Forest Alliance		Marissa Woods Nature Preserve	20	C	A	BC	B	
		Posen Woods Nature Preserve	26	C	A	BC	B	
Little Bluestem - Indian Grass Herbaceous Alliance		Lake Murphysboro State Park Prairie	1	C	A	BC	B	
Small Patch Alliances								
Buttonbush Semipermanently Flooded Shrubland Alliance		Miller Shrub Swamp Nature Preserve	22	C	A	BC	B	
		Mount Vernon Hill Country (222Gb) Total:	114					

Subsection 234An. North Mississippi River Alluvial Plain

American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Horseshoe Lake Nature Preserve	40	D	BC	BC	BC	
(Swamp Chestnut Oak, Cherrybark Oak, Shumard Oak) - Sweetgum Temporarily Flooded Forest Alliance		Horseshoe Lake Nature Preserve	30	C	AC	BC	B	
Bald-cypress Semipermanently Flooded Forest Alliance		Horseshoe Lake Nature Preserve	200	C	AC	BC	B*	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Horseshoe Lake Nature Preserve	200	B	BC	BC	B	
Buttonbush Semipermanently Flooded Shrubland Alliance		Horseshoe Lake Nature Preserve	20	C	BC	BC	BC	
		North Mississippi River Alluvial Plain (234An) Total:	490					
		Grand Total:	14,841					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.

* Rank assignment is uncertain.

Shawnee Appendix C. Unrepresented alliances (Forest-wide) on the Shawnee National Forest

The following alliances are not represented in any of the subsections in which they occur on Shawnee National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- Silver Maple Temporarily Flooded Forest Alliance (large patch, widespread)
- Water Tupelo - (Bald Cypress) Semipermanently Flooded Forest Alliance (large patch, widespread)
- Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous Alliance (small patch, widespread)
- Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance (small patch, widespread)

Shawnee Appendix D. Shawnee National Forest Ecological Areas

These Shawnee National Forest Ecological Areas were identified by Max Hutchison, Ecologist with the Ullin Office of the Nature Conservancy, as being good candidates for RNA establishment. All are identified in the Forest Plan, but they are not RNA-equivalents with their current level of protection. Subsection and alliance information is derived from Illinois Heritage Element Occurrences; there are not Element Occurrences in all of the Areas.

Name	Subsection	Acres	Alliances
Bell Smith Springs	?	1,260	
Big Brushy Ridge	222Aq	150	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Bulge Hole	?	78	
Caney Branch Barrens	?	48	
Cedar Bluff	?	285	
Copperous Branch Limestone Barrons	?	26	
Cretaceous Hills	?	200	
Crow Knob	222Dh	15	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous • Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous
Dean Cemetary East	?	20	
Dean Cemetary West	222Ca	132	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous • Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous
Double Branch Hole	?	85	
Draper's Bluff	?	334	
Garden of the Gods	?	95	
Gibbons Creek Barrens	222Dh	49	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Grantsburg Swamp	?	751	
Gyp Williams Hollow	?	320	
Hayes Creek/Fox Den	?	54	
Horse Cave Area	?	33	
Jackson Hole	222Dh	116	• Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous
Jackson Hollow	?	289	
Kaskaskia Woods	?	24	
Keeling Hill North	?	23	
Keeling Hill South	?	45	
Kickasola Cemetary	222Ca	36	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous • Fringed Sedge - Royal Fern / Sphagnum spp. Saturated Herbaceous
Leisure City Barrens	?	4	
Little Grand Canyon/Horseshoe Bluff	?	1,023	

(cont.)

(cont. from previous page)

Name	Subsection	Acres	Alliances
Lusk Creek Canyon	?	253	
Lusk Creek North	?	2.5	
Martha's Woods Site	?	6	
Massac Tower Springs	?	35	
Millstone Bluff	?	85	
Odom Tract	?	50	
Pine Hills Annex	?	7	
Pine Hollow	?	90	
Pleasant Valley Limestone Barrens	?	4.5	
Poco Cemetery East	222Ca	34	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Poco Cemetery North	222Ca	22	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Pounds Hollow	?	197	
Provo Cemetery	222Aq	50	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Robnett Barrens	222Ca	21	• Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous
Russell Cemetery Barrens	?	18	
Sand Cave	?	40	
Simpson Township Barrens	?	65	
Snow Springs	?	0.5	
Split Rock Hollow	?	2	
Trigg Tower Sandstone Barrens	?	197	

IX. L. Superior National Forest RNA Assessment

SUPERIOR SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Superior National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Superior National Forest lands. The Superior occupies portions of 6 subsections. Thirty-seven alliances occur on Superior National Forest lands, with the number of alliances ranging from 6 to 31 in each subsection. There are 117 subsection-alliance combinations on Superior lands; these are the ecosystems to represent for the Superior National Forest.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Eight of the Superior alliance-subsection combinations are represented by the 4 currently established Superior RNAs.

Existing **RNA-equivalents** in these subsections include:

- 17 Minnesota Scientific and Natural Areas and
- portions of the Boundary Waters Canoe Area Wilderness.

These 18 RNA-equivalents, along with the 4 RNAs, currently represent 32 (27%) of the Superior alliance-subsection combinations (ecosystem).

UNREPRESENTED ECOSYSTEMS

The Superior National Forest has 85 ecosystems that are unrepresented by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating other currently designated areas as RNA-equivalents,
- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORITIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Superior National Forest are:

- Toimi Uplands (212Ld) and
- Laurentian Highlands (212Lc).

The Superior has high prominence (> 20%) in these subsections, and fewer than 10% of the alliances are represented in each.

The North Shore Highlands (212Lb) is a **medium-priority subsection** because its prominence is greater than 15% in the Superior, and a third of the subsection's alliances are represented.

Low-priority subsections are Littlefork/Vermillion Uplands (212Ma), Tamarack Lowlands (212Nd), and Border Lakes (212La). The first two subsections have marginal prominence on the Superior, but they should be evaluated for special land type or other ecological features before deciding if little or no representation should occur. The Border Lakes is nearly adequately represented, at least in terms of land area and biological variety.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), there are 8 **high-priority alliances** (of 37 Superior alliances). These may be high-priority in each subsection in which they occur. Seven are unrepresented in at least 2 of the subsections in which they occur on the Superior:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Forest Alliance
- Sugar Maple - Yellow Birch - American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

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IX.L.1. INTRODUCTION

The Superior National Forest is located in northeastern Minnesota (Superior Figure 1). Its proclamation boundaries and purchase unit boundaries contain 3,867,142 acres; 2,171,322 acres (56%) of this land is currently (FY97) managed by the Superior National Forest. Although national forests may acquire more land within proclamation boundaries and purchase units, RNAs are not likely to be established on inholdings anytime in the near future. Therefore in this assessment we focus on lands managed by the USFS, which we call "national forest land" or "national forest ownership."

The Superior National Forest occurs entirely in Province 212 (Laurentian Mixed Forest Province). Overview Appendix IX lists the other national forests in the Province. The Superior National Forests can work with these national forests to fill goals and establish priorities for the Province.

IX.L.2. METHODS

See Methods of the assessment for a more detailed description of methods. The following section describes methods specific to the Superior.

IX.L.2.a. Subsections

Ed Linquist, GIS coordinator for the Superior National Forest, provided us with a list of subsections occurring on the Superior National Forest, and an estimate of the percentage of the National Forest in each subsection. For subsections he used the digital subsection map of Keys *et al.* (1995, 1:3,500,000). He used a 1:24,000 digital copy of the Superior National Forest proclamation and purchase unit boundaries, because a digital map of ownership boundaries was not available. He also provided a rough estimate of the percent of actual ownership within the proclamation boundaries in each subsection. (These values vary from 20 - 90%.). From the proclamation and ownership values we calculated the percentage of Superior National Forest land (ownership) in each subsection, and the percentage of each subsection on Superior National Forest land (ownership).

IX.L.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Minnesota, we first compiled the natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated to associations (one level below alliance). We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital Subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because only a subset of community occurrences are documented in the Heritage database, state Heritage and national forest ecologists added additional associations and alliances to each subsection list and provided additional information about the presence of alliances on national forest land. Alliances that occur on Forest Service lands are the focus of the RNA assessment.

IX.L.2.c. Identifying RNA-equivalents

RNA-equivalents were identified in discussions of ecologists of the USDA Forest Service, the Minnesota Department of Natural Resources, and the authors. The RNA Committee of the Superior National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency.

IX.L.2.d. Digitizing RNAs and RNA-equivalents

The Superior National Forest provided USGS 7.5 minute (1:24,000 scale) topographical maps with outlines of RNA boundaries. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of Superior National Forest RNAs (Superior Figure 2) in the projection used by the Superior National Forest (UTM 15 NAD 83), or a Lake States or Region-wide RNA cover at regional projections.

The Minnesota Natural Heritage Program provided us with a digital cover of Minnesota Scientific and Natural Areas. The Superior National Forest provided us with a digital cover of the boundary of the Boundary Waters Canoe Area Wilderness (BWCAW). We currently do not have a cover of Heinselman's (1996) "virgin" (unlogged) portion of the BWCAW.

IX.L.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All Establishment Records for the Superior National Forest RNAs contain information about vegetation in the form of SAF cover types, with total acreage or percent of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type. The cover types or descriptions for the 2 RNAs established in 1942 may be out of date.

Our sources for community occurrences on Minnesota Scientific and Natural Areas were paper files from the Minnesota Scientific and Natural Areas Program and Element Occurrence data from the Minnesota Natural Heritage Program. Total acreage for each SNA came from Minnesota Department of Natural Resources (1995). Our results for peatland SNAs were reviewed by Norm Aaseng of the Minnesota County Biological Survey. Questions remain on several of the other SNAs (Superior Appendix B).

Our source of BWCAW information is Heinselman (1996, p. 18). We used his list of communities for the unlogged (virgin) portion of the BWCAW, and identified alliances that correspond to his community types. There is some uncertainty in these assignments, because Heinselman's classification scheme is somewhat different than The National Vegetation Classification. The total acreage in the "virgin" portion of the BWCAW for each community type is shown in Superior Appendix B.

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not fill a "target". Instead it is listed with a question mark in Superior Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Superior National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.N.3. RESULTS

IX.N.3.a. Subsections on national forest land

The 6 subsections that occur on Superior National Forest land are (Superior Figure 2):

- Border Lakes (212La)
- Laurentian Uplands (212Lc)
- North Shore Highlands (212Lb)
- Toimi Uplands (212Ld)
- Littlefork/Vermillion Uplands (212Ma)
- Tamarack Lowlands (212Nd)

The Superior National Forest occurs primarily (83%) on two subsections (Superior Table 4, Superior Figure 3): Border Lakes (212La, 56% of Superior National Forest land) and Laurentian Highlands (212Lc, 27%). These subsections are also the subsections that contain the most Superior National Forest land: 81% of Subsection 212La and 72% of Subsection 212Lc.

The Superior National Forest lands occupy a substantial portion of the Toimi Uplands (212Ld) and the North Shore Highlands (212Lb). The Superior National Forest manages 20% of Subsection 212Ld and 18% of Subsection 212Lb. These are relatively small subsections; Subsection 212Ld comprises 5% of the lands of the Superior National Forest and Subsection 212Lb comprises 8%.

Less than 1% of Subsections 212Ma and 212Nd is managed by the Superior National Forest, and each subsection occupies less than 1% of total National Forest land. Superior Figure 3 shows a much larger area than 1% for 212Ma; this is because almost all the land in 212Ma is the Kabetogama Purchase Unit, and only 13% of this unit is national forest land (*i.e.*, has been purchased).

The percentage of a subsection managed by the Forest Service gives an indication of the *prominence* of land coverage by the Forest in the subsection. In this report, subsections are listed in order of prominence (Superior Table 4).

IX.N.3.c. Natural communities in subsections

A total of 51 alliances are reported to occur in these 6 subsections. Of these, 37 are known to be on Superior National Forest land (Superior Table 5, first column); the 14 alliances not reported to occur on Superior National Forest land are listed in Superior Appendix A.

Of the 37 alliances occurring on the Superior National Forest, 8 are **matrix** alliances (see Superior Table 5, first set of alliances), 17 are **large patch** (second set) and 12 are **small patch** (third set). (See "National Vegetation Classification".)

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on Superior National Forest land in each subsection:

- 212La (Border Lakes): 28 alliances (7 matrix, 13 large patch, 8 small patch)
- 212Lc (Laurentian Highlands): 31 alliances (7 matrix, 15 large patch, 9 small patch)
- 212Ld (Toimi Uplands): 20 alliances (5 matrix, 9 large patch, 6 small patch)
- 212Lb (North Shore Highlands): 21 alliances (6 matrix, 10 large patch, 5 small patch)
- 212Ma (Littlefork/Vermillion Uplands): 11 alliances (1 matrix, 6 large patch, 4 small patch)
- 212Nd (Tamarack Lowlands): 6 alliances (3 matrix, 2 large patch, 1 small patch)

Superior Table 5 shows the alliances that occur in each subsection. There are a total of 117 subsection-alliance combinations

IX.N.3.d. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation is provided by RNAs and RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Superior Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Superior Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

There are 4 established RNAs (Superior Tables 1, 6) and 2 candidate RNAs (cRNAs) on the Superior National Forest. Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

A digital cover of the established RNAs on the Superior National Forest (Superior Figure 2) is available in the projection used by the Superior National Forest (UTM 15 NAD 83) from the Regional RNA Coordinator. A Lake States national forests RNA cover is also available.

RNA-equivalents

Designations that are RNA-equivalents for the Superior National Forest are (Superior Table 2):

- all Minnesota Scientific and Natural Areas (SNAs)
- all preserves of The Nature Conservancy (TNC), and
- unlogged portions of the Boundary Waters Canoe Area Wilderness (BWCAW)

Seventeen Scientific and Natural Areas (SNAs) serve as RNA-equivalents for the Superior National Forest, along with the unlogged (virgin) portions of the Boundary Waters Canoe Area Wilderness (BWCAW), which count as 1 RNA-equivalent (Superior Table 6). Although The Nature Conservancy's (TNC's) preserves are considered RNA-equivalents in Minnesota, currently no established preserves occur in subsections of the Superior National Forest. The RNA Committee of the Superior National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency (Superior Table 3).

Subsection 212La (Border Lakes)

Subsection 212La contains 2 RNAs, together covering 1,613 acres (Superior Tables 6, 7a, Superior Figure 3):

- Keeley Creek
- Lac La Croix

RNA-equivalent protection covers 548,024 acres of the subsection (Superior Table 7a). The majority (545,000 acres) of this protection is by the Superior National Forest in:

- unlogged (virgin) portions of the Boundary Waters Canoe Area Wilderness (BWCAW, Superior Figure 2).

The additional 3,024 acres of RNA-equivalent protection come from 5 SNAs (Superior Tables 6, 7a, Superior Figure 3):

- Burntside Islands
- Eagle's Nest Island No. 4
- Kawishiwi Triangle
- Lost Lake Peatland
- Purvis Lake - Ober Foundation

Thus 27% of the subsection is protected by RNAs and RNA-equivalents (Superior Table 7a).

Natural communities (alliances)

Of 28 alliances reported to be on National Forest land in Subsection 212La, 20 are represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (Superior Table 5, column 212La; Superior Table 7b; Superior Figure 4). Most of these occurrences are on the BWCAW.

Of the 28 alliances, 7 are matrix and 13 are large patch. All the **matrix** alliances are represented and almost all of the **large patch** (12 of 13) alliances are represented. The one unrepresented large patch alliance is Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance.

Only 1 of the 8 **small patch** communities is represented:

- (Jack Pine, Red Pine) Woodland Alliance

However, the lack of representation of small patch alliances may be more an indication of insufficient information than a real need. All unrepresented types are non-forested (Superior Table 5, column 212La) and have not been well described for the BWCAW (Heinselman 1996). Their distribution should be documented to more accurately determine the representation needs in this subsection.

One small patch alliance has a low-quality occurrence on Purvis Lake-Ober Foundation SNA:

- Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance

A BC-rank was given to this occurrence due to its small size (Appendix B).

Subsection 212Lc (Laurentian Highlands)

Subsection 212Lc contains no RNAs and 1 RNA-equivalent (Superior Tables 6, 7a, Superior Figure 3):

- Sand Lake Peatland SNA

This SNA is 4,545 acres or 0.3 % of the subsection (Superior Table 7a). It is a peatland SNA and represents only a small portion of the geophysical and biological variation in the subsection.

Natural communities (alliances)

Of the 31 alliances reported to be on Forest land in Subsection 212Lc, 3 are represented by a high-quality occurrence on Sand Lake Peatland SNA (Superior Table 5, column 212Lc; Superior Table 7b; Superior Figure 4). All 3 are peatland types.

The 3 represented alliances are all **large patch**; 12 additional large patch alliances are not represented. None of the 7 **matrix** alliances and 9 **small patch** alliances are represented.

Subsection 212Ld (Toimi Uplands)

Subsection 212Ld contains no RNAs or RNA-equivalents (Superior Tables 6, 7a, Superior Figure 3), and clearly is not adequately represented.

Natural communities (alliances)

Twenty alliances (5 matrix, 9 large patch, and 6 small patch) are reported to occur on Forest land in Subsection 212Ld, but none are represented, as there are no RNAs or RNA-equivalents (Superior Table 5, column 212Ld; Superior Tables 7a, 7b; Superior Figure 4).

Subsection 212Lb (North Shore Highlands)

Subsection 212Lb contains 2 RNAs, together covering 480 acres (Superior Tables 6, 7a, Superior Figure 3):

- Marble Lake Lookout
- Schroeder

An additional 1,511 acres is protected by 6 SNAs (Superior Tables 6, 7a, Superior Figure 3):

- Butterwort Cliffs
- Hovland Woods

- Lutsen Natural Area
- Moose Mountain
- Spring Beauty Northern Hardwoods
- Sugarloaf Point

The total representation is 0.2 % of the subsection (Superior Table 7a).

Natural communities (alliances)

Of the 21 alliances reported to be on National Forest land in Subsection 212Lb, 7 are currently represented by a high-quality occurrence on at least one RNA or RNA-equivalent (Superior Table 5, column 212Lb; Superior Table 7b; Superior Figure 4).

The represented alliances are mostly forested types and are evenly distributed by community pattern. Sugar Maple - Yellow Birch - (American Beech) Forest Alliance (matrix) is the most extensively represented (5 B-ranked occurrences and 1 BC-ranked occurrence).

Of 6 **matrix** alliances, 2 are represented; of 10 **large patch** alliances, 3 are represented; and of 5 **small patch** alliances, 2 are represented.

Two of the three unrepresented matrix alliances and 1 of the 7 unrepresented large patch alliances have a low-quality occurrence on an SNA:

- White Pine Forest Alliance (matrix, Hovland Woods SNA)
- White Spruce - Balsam Fir - Aspen Forest Alliance (matrix, Lutsen Natural Area SNA)
- Black Spruce Saturated Forest Alliance (large patch, Marble Lake Lookout RNA)

These 3 occurrences (Appendix B) were given a BC rank because of their small size. The reported acreages for these occurrences should be verified.

Subsection 212Ma (Littlefork/Vermillion Uplands)

Subsection 212Ma (Littlefork/Vermillion Uplands) is represented by 3 peatland SNAs (Superior Tables 6, 7a, Superior Figure 3):

- East Rat Root River Peatland
- Nett Lake Peatland
- West Rat Root River Peatland

for a total of 4,572 acres or 0.4 % of the subsection (Superior Table 7a).

Natural communities (alliances)

This subsection does not contain much National Forest land. Only 11 alliances are reported to be on National Forest land in Subsection 212Ma. West and East Rat Root River Peatland SNAs represent 2 alliances with high-quality occurrences (Superior Table 5, column 212Ma; Superior Table 7b; Superior Figure 4): Black Spruce Saturated Woodland Alliance and Leatherleaf Saturated Dwarf-Shrubland Alliance. (The alliances that occur on Nett Lake Peatland SNA have not been reported on National Forest land.)

The 2 represented alliances are **large patch**. Four **large patch**, 1 **matrix** and 4 **small patch** alliances are unrepresented.

Subsection 212Nd (Tamarack Lowlands)

Subsection 212Nd (Tamarack Lowlands) is represented by 2 SNAs (Superior Tables 6, 7a, Superior Figure 3):

- McGregor Marsh
- Wawina Peatland

for a total of 4,474 acres or 0.3% of the subsection (Superior Table 7a).

Natural communities (alliances)

This subsection does not contain much National Forest land. Only 6 alliances are reported to be on National Forest land in 212Nd (Superior Table 5, column 212Nd; Superior Table 7b; Superior Figure 4). None of these alliances (3 matrix, 2 large patch, and 1 small patch) are represented. There is not enough information about McGregor Marsh SNA to identify the alliances that occur there (Appendix B), and the alliances that occur on Wawina Peatland have not been reported on National Forest land.

IX.N.3.e. Synthesis: Needs for ecosystem representation

The following table summarizes the alliance representation for the Superior National Forest, and shows our suggested priority ranking of the subsections based on prominence and representation of biological variation (percentage of alliances represented). The percentage of national forest land (dominance) and percentage acres represented in each subsection was not used to prioritize the subsections, though the Superior's RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Superior Table 5 by shaded cells that contain no number.

Subsection	Dominance Percentage of Superior NF in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Superior NF lands	Percentage of NF alliances represented	Proposed priority
212La (Border Lakes)	56	27	81	71	low
212Lc (Laurentian Highlands)	27	0.3	72	10	high
212Ld (Toimi Uplands)	5	0	20	0	high
212Lb (North Shore Highlands)	8	0.2	18	33	med.
212Ma (Littlefork/Vermillion Uplands)	3	0.4	1	18	low
212Nd (Tamarack Lowlands)	0.3	0.3	0.9	0	low

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Within this overall order, two or more subsections with the same proposed priority are listed in arbitrary order. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

The Toimi Uplands (**212Ld**) is a high priority to represent, because it currently contains no RNAs or RNA-equivalents. The Laurentian Highlands (**212Lc**) is also clearly critical, as it has high prominence to the Forest and almost no representation of its biological variety. The North Shore Highlands (**212Lb**) is more important than Littlefork/Vermillion Uplands (212Ma) and Tamarack Lowlands (212Nd), because it contains more National Forest land and over half of its biological variety (in terms of natural communities (alliances)) is not represented. In terms of land area, Subsections **212Ma** (Littlefork/Vermillion Uplands) and **212Nd** (Tamarack Lowlands) are of marginal prominence, but they should be evaluated for special land type or other ecological features before deciding if little or no representation should occur. Border Lakes (**212La**) is a low priority because it is nearly adequately represented, at least in terms of land area and biological variety.

Subsection 212Ld (Toimi Uplands)

None of the 20 alliances are represented (Superior Figure 3). Because none of the subsection is represented and the Superior National Forest lands are prominent in this subsection, it is probably the highest priority to represent.

Within the subsection, the matrix alliances may be first priority for RNA establishment:

- Red Pine Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Species Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Lc (Laurentian Highlands)

Of 31 alliances, 3 are represented, leaving 28 (90%) alliances in need of representation (Superior Figure 3). The only represented alliances are peatland types. Especially considering the Superior National Forest's prominence in this subsection, further representation of the biological variation in this subsection is very important.

None of the matrix alliances are represented in this subsection, and these may be of highest priority for RNA establishment:

- Jack Pine Forest Alliance
- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance
- White Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Species Forest Alliance
- Sugar Maple - Yellow Birch - (American Beech) Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Lb (North Shore Highlands)

Of 21 alliances, 7 are represented, leaving 14 (67%) alliances in need of representation (Superior Figure 3).

The following matrix types are a priority for the subsection:

- Red Pine Forest Alliance
- White Pine - (Red Pine) - Quaking Aspen Forest Alliance

Three of the unrepresented alliances have a low-quality occurrence on and RNA or RNA-equivalent. The quality/viability of these occurrences should be verified:

- White Pine Forest Alliance (matrix, Hovland Woods SNA)
- White Spruce - Balsam Fir - Aspen Forest Alliance (matrix, Hovland Woods SNA)
- Black Spruce Saturated Forest Alliance (large patch, Marble Lake Lookout RNA)

Subsection 212Ma (Littlefork/Vermillion Uplands)

Of 11 alliances, 2 are represented, leaving 9 (82%) alliances in need of representation (Superior Figure 3). The Superior National Forest has less prominence in this subsection, so unless special features are identified as important, the inadequate representation of this subsection may be of less concern to the Forest.

The 1 unrepresented matrix alliance is:

- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212Nd (Tamarack Lowlands)

None of the 6 alliances are represented (Superior Figure 3). The Superior National Forest has less prominence in this subsection, so unless special features are identified as important, the inadequate representation of this subsection may be of less concern to the Forest.

The 3 unrepresented matrix alliances are:

- Jack Pine Forest Alliance
- White Spruce - Balsam Fir - Aspen Species Forest Alliance
- Quaking Aspen - Paper Birch Forest Alliance

Subsection 212La (Border Lakes)

Of 28 alliances, 20 are reported to be represented, leaving 8 (29%) alliances in need of representation (Superior Figure 4). However, many of the unrepresented types may occur on the BWCAW. One of the unrepresented alliances has a low-quality occurrence on an RNA-equivalent.

Though the Border Lakes Subsection has the highest Superior Forest prominence, most of its biological variety appears to be represented and it is therefore a lower priority for RNA establishment.

To determine if additional representation of this subsection is needed, the uncertain presence of the following 6 non-forested small patch alliances on the BWCAW needs verification:

- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance
- Sedge spp. (*Carex rostrata*, *C. utriculata*) Seasonally Flooded Herbaceous Alliance
- Wiregrass Sedge Saturated Herbaceous Alliance
- Open Pavement Sparse Vegetation
- Inland Strand Beach Sparse Vegetation
- Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation

Another priority is the unrepresented large patch alliance:

- Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance

SUPERIOR TABLES

Superior Table 1. Established research natural areas (RNAs) of the Superior National Forest

RNA	Acres	Subsection	Established
Keeley Creek	640	212La	1942
Lac La Croix	973	212La	1942
Schroeder	360	212Lb	1973
Marble Lake Lookout	120	212Lb	1988

Superior Table 2. Designations identified to date as RNA-equivalents for the Superior National Forest

Protected area designation	Managed by
all Minnesota Scientific and Natural Areas (SNAs)	Minnesota Department of Natural Resources
all preserves of The Nature Conservancy (TNC)*	The Nature Conservancy (private)
unlogged portions of the Boundary Waters Canoe Area Wilderness (BWCAW)	USDA Forest Service

*Currently no TNC preserves exist in subsections of the Superior National Forest.

Superior Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Superior National Forest

The Superior National Forest may work with these organizations and agencies to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Special Areas, including additional Wilderness	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities (University of Minnesota, private)

Superior Table 4. Subsections of the Superior National Forest (NF), in order of prominence
"NF acres" is the number of acres of Superior National Forest land (ownership) in the subsection. "Prominence" is the percentage of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Dominance" is NF acres divided by Superior National Forest total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Superior Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF lands in subsection
212La–Border Lakes	2,006,212	1,625,032	81	56
212Lc–Laurentian Highlands	1,486,610	1,070,359	72	27
212Ld–Toimi Uplands	485,676	97,135	20	5
212Lb–North Shore Highlands	1,237,664	222,780	18	8
212Ma–Littlefork/Vermillion Uplands	1,283,633	12,836	1	3
212Nd–Tamarack Lowlands	1,785,125	16,066	0.9	0.3
Superior National Forest total ownership:		3,044,208		

Superior Table 5. Subsections and alliances reported on Superior National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Superior Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) BL= Border Lakes, LH= Laurentian Highlands, TU= Toimi Uplands, NSH= North Shore Highlands, LVU= Littlefork/ Vermillion Uplands, TL= Tamarack Lowlands. For a list of alliances occurring in subsections of the Superior NF subsections but not reported on NF land, see Superior Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

--Subsections of Superior NF--

Community Pattern **Alliances Reported on NF Land**	212La (BL)		212Lc (LH)		212Ld (TU)		212Lb (NSH)		212Ma (LVU)		212Nd (TL)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Jack Pine Forest Alliance	(1)* •		•		•		▫		•		•	
Red Pine Forest Alliance	1 (2)* •	(2)	•		•		•		•		•	
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	(1)* •		•		•		•		•		•	
White Pine Forest Alliance	1 (2)* •	(1)	•		•		•	(1)	•		•	
White Spruce - Balsam Fir - Aspen Forest Alliance	(1)* •		•		•		•	(1)	•		•	
White Spruce - Balsam Fir Forest Alliance	(1)* •	(1)	•		•		(1) •		•		•	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	▫		•		•		2 (3) •	(1)			•	
Quaking Aspen - Paper Birch Forest Alliance	1 (1)* •		•		•		(1) •		•		•	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Black Spruce Forest Alliance	1 (1)* •		•		•		▫		•			▫
Northern White Cedar - Yellow Birch Forest Alliance	▫		•		▫		•		▫			
Northern White Cedar Forest Alliance	(1)* •	(1)	•		•		(2) •		•		•	
Red Oak - Sugar Maple - (White Oak) Forest Alliance			•		▫		•				•	
Paper Birch Forest Alliance	(1)* •		•		•		•		•		•	
Silver Maple Temporarily Flooded Forest Alliance			•		•						•	
Black Spruce Saturated Forest Alliance	1 (2)* •	(1)	•		•		•	1	(1) •		•	

*Alliance occurs in the BWCAW where there is at least one, and probably many more, viable (A- or B-ranked) occurrences.

Community Pattern **Alliances Reported on NF Land**	--Subsections of Superior NF-- 212La (BL)	212Lc (LH)	212Ld (TU)	212Lb (NSH)	212Ma (LVU)	212Nd (TL)
Northern White Cedar Saturated Forest Alliance	(1)* ▪	▪	▪	1 ▪ 1	▪	▪
Black Ash - Red Maple Saturated Forest Alliance	(1)* ▪ (1)	▪	▪	1 ▪	▪	▪
Tamarack Saturated Forest Alliance	(1)* ▪	▪	▪	▪	(2) ▪	▪
Black Spruce Saturated Woodland Alliance	(2)* ▪	(1) ▪	▫	▪	(2) ▪	(1) ▪
Speckled Alder Seasonally Flooded Shrubland Alliance	(1)* ▪	▪	▪	▪	▪	▪
Leatherleaf Saturated Dwarf-Shrubland Alliance	(1)* ▪	(1) ▪	▪	▪	(2) ▪	▫
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▪	▪	▪	▪	▪	▪
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance	(2)* ▪	(1) ▪	▪	▪	(1) ▪	(1) ▪
Jack Pine / Lichen Nonvascular Alliance	(1)* ▪	▫			▫	
Rock Outcrop/Butte Sparse Vegetation	▪	▪		▪	▪	
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
(Jack Pine, Red Pine) Woodland Alliance	(1)* ▪	▫			▫	
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance	▪	▫				
Bog Birch - (Willow) Saturated Shrubland Alliance	▪ (1)	▪	▪	▫	▪	▫
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance	▪ (1)	▪		▫		
Wild Rice Semipermanently Flooded Herbaceous Alliance	▪	▪	▪			
Wiregrass Sedge Saturated Herbaceous Alliance	▪	▪	▪	▪	(2) ▪	(1) ▪
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪	▪	▪	▫	▪	
Open Bluff/Cliff Sparse Vegetation	▪			(1) ▪	▫	
Open Pavement Sparse Vegetation	▪	▪		(1) ▪ (1)	▪	
Cobble/Gravel Shore Sparse Vegetation	▪	▪		▪ (1)	▫	
Inland Strand Beach Sparse Vegetation	▪	▪	▪	▪	▪	
Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation	▪	▪	▪	▪	▪	▪

*Alliance occurs in the BWCAW where there is at least one, and probably many more, viable (A- or B-ranked) occurrences.

Superior Table 6. RNAs and RNA-equivalents of the Superior National Forest
Size, in acres, of each RNA or RNA-equivalent is listed in parentheses. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA. For the Superior National Forest, all non-Forest Service RNA-equivalents are Minnesota Scientific and Natural Areas (SNAs).

Subsec -tion	RNA (acres)	RNA-equivalent (acres)	
		Forest Service	SNA (non-Forest Service)
212La	Keeley Creek (640) Lac La Croix (973)	Unlogged (virgin) portions of the Boundary Waters Canoe Area Wilderness (BWCAW, 545,000)	Burntside Islands (64) Eagle's Nest Island No. 4 (4) Kawishiwi Triangle (80) Lost Lake Peatland (2,736) Purvis Lake - Ober Foundation (140)
212Lb	Marble Lake Lookout (120) Schroeder (360)		Butterwort Cliffs (53) Hovland Woods (280) Lutsen Natural Area (720) Moose Mountain (55) Spring Beauty Northern Hardwoods (400) Sugarloaf Point (3)
212Lc			Sand Lake Peatland (4,545)
212Ld			
212Ma			East Rat Root River Peatland (2,732) Nett Lake Peatland (410) West Rat Root River Peatland (1,430)
212Nd			McGregor Marsh (400) Wawina Peatland (4,074)

Superior Table 7. Summary of subsection representation on the Superior National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land.

Subsection	Number of		Land Area Representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
212La. Border Lakes	2	6	1,613	548,024	549,637 *27%*
212Lc. Laurentian Highlands		1		4,545	4,545 *<1%*
212Ld. Toimi Uplands					0 *0%*
212Lb. North Shore Highlands	2	6	480	1,511	1,991 *<1%*
212Ma. Littlefork/Vermillion Uplands		3		4,572	4,572 *<1%*
212Nd. Tamarack Lowlands		2		4,474	4,474 *<1%*
TOTAL	4	18	2,093	563,126	565,219 *7%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted.

Subsection	# Alliances on NF land	Alliance Representation			Low-quality*
		RNA	RNA-eq	Total**	
212La. Border Lakes	28	5 *18%*	20 *71%*	20 *71%*	1
212Lc. Laurentian Highlands	31		3 *10%*	3 *10%*	
212Ld. Toimi Uplands	20			0	
212Lb. North Shore Highlands	21	3 *14%*	5 *24%*	7 *33%*	3
212Ma. Littlefork/Vermillion Uplands	11		2 *18%*	2 *18%*	
212Nd. Tamarack Lowlands	6			0	

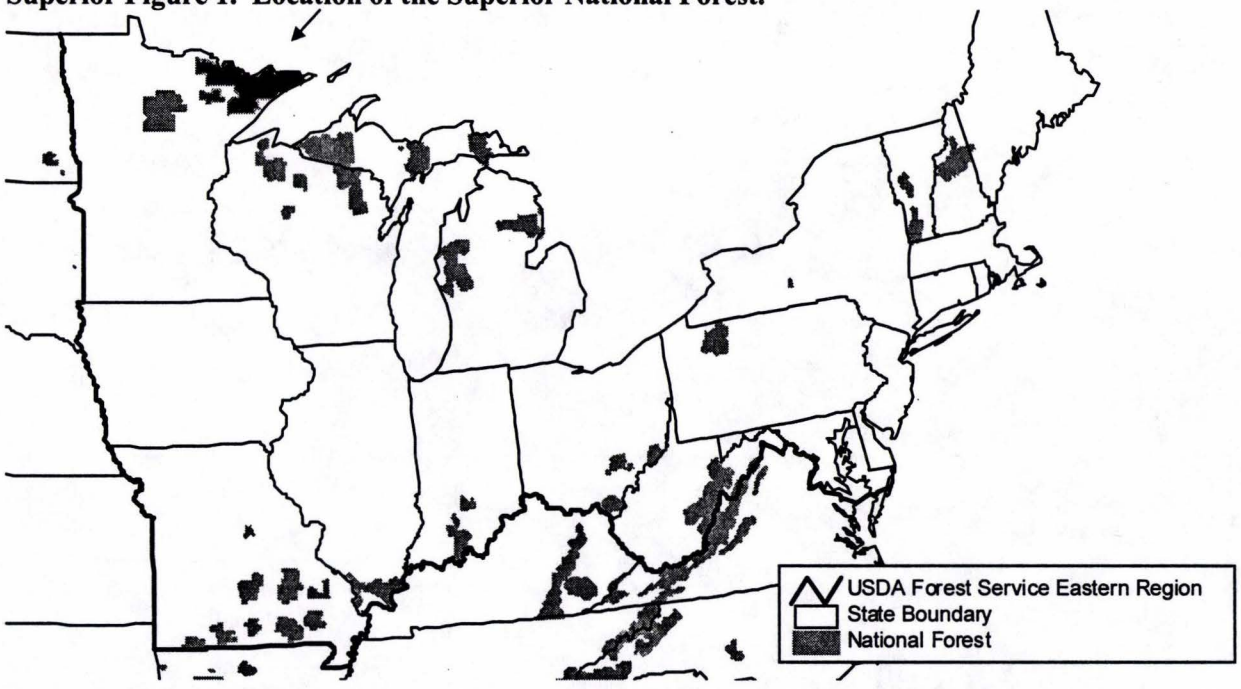
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Superior Table 8. Alliances of the Superior National Forest arranged by community pattern and community distribution

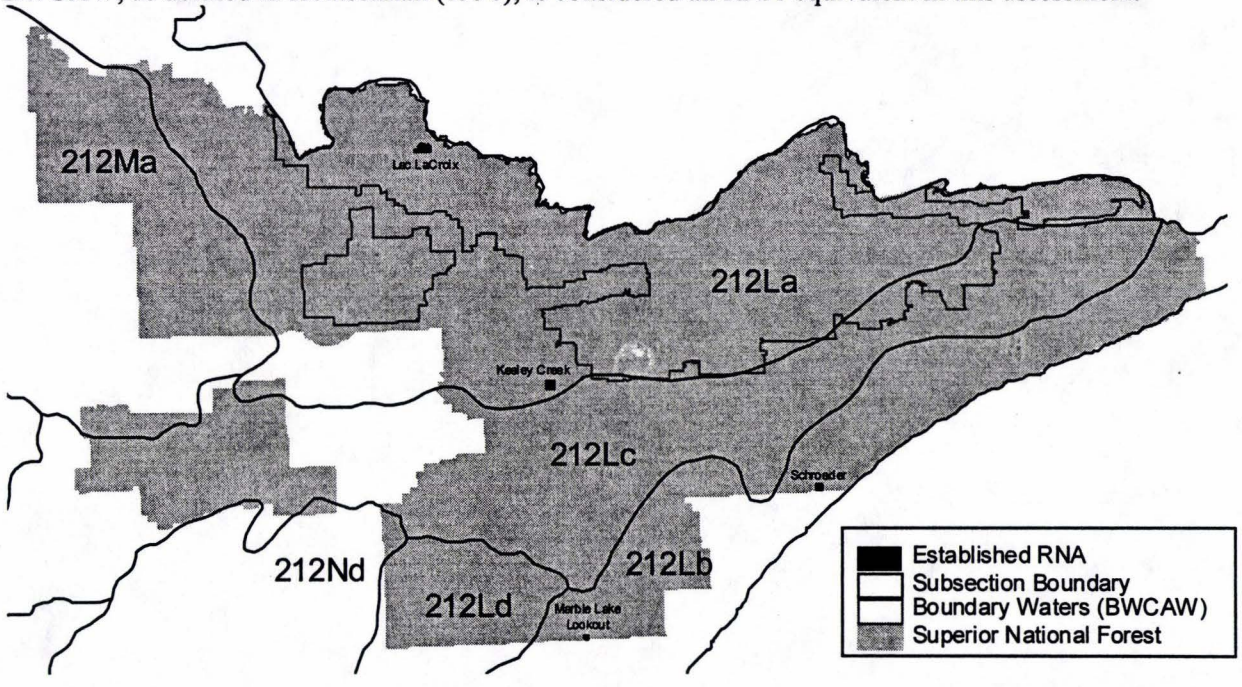
COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	**LARGE PATCH**	**SMALL PATCH**
ENDEMIC	• Red Pine Forest	• Eastern White Cedar - Yellow Birch Forest	• (Jack Pine, Red Pine) Woodland • Cobble/gravel shore sparse vegetation
LIMITED	• White Pine - (Red Pine) - Quaking Aspen Forest • White Pine Forest	• Eastern White Cedar Forest • Eastern White Cedar Saturated Forest • Black Ash - Red Maple Saturated Forest • Jack Pine / Lichen spp. Nonvascular	• Wild Rice Species Semipermanently Flooded Herbaceous • Open pavement sparse vegetation • Inland strand beach sparse vegetation
WIDESPREAD	• Jack Pine Forest • White Spruce - Balsam Fir - Aspen Forest • White Spruce - Balsam Fir Forest • Sugar Maple - Yellow Birch - (American Beech) Forest • Quaking Aspen - Paper Birch Forest	• Black Spruce Forest • Paper Birch Forest • Black Spruce Saturated Forest • Tamarack Saturated Forest • Black Spruce Saturated Woodland • Speckled Alder Seasonally Flooded Shrubland • Leatherleaf Saturated Dwarf-Shrubland • Cattail (Narrowleaf, Common) - (Bulrush species) Semipermanently Flooded Herbaceous • Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous • Rock Outcrop/Butte Sparse Vegetation	• Red Osier Dogwood - Willow spp. Seasonally Flooded Shrubland • Bog Birch - (Willow spp.) Saturated Shrubland • Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous • Wiregrass Sedge Saturated Herbaceous • Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous • Open bluff/cliff sparse vegetation
PERIPHERAL		• Red Oak - Sugar Maple - (White Oak) Forest • Silver Maple Temporarily Flooded Forest	• Non-tidal mud flat seasonally/temporarily flooded sparse vegetation

SUPERIOR FIGURES

Superior Figure 1. Location of the Superior National Forest.

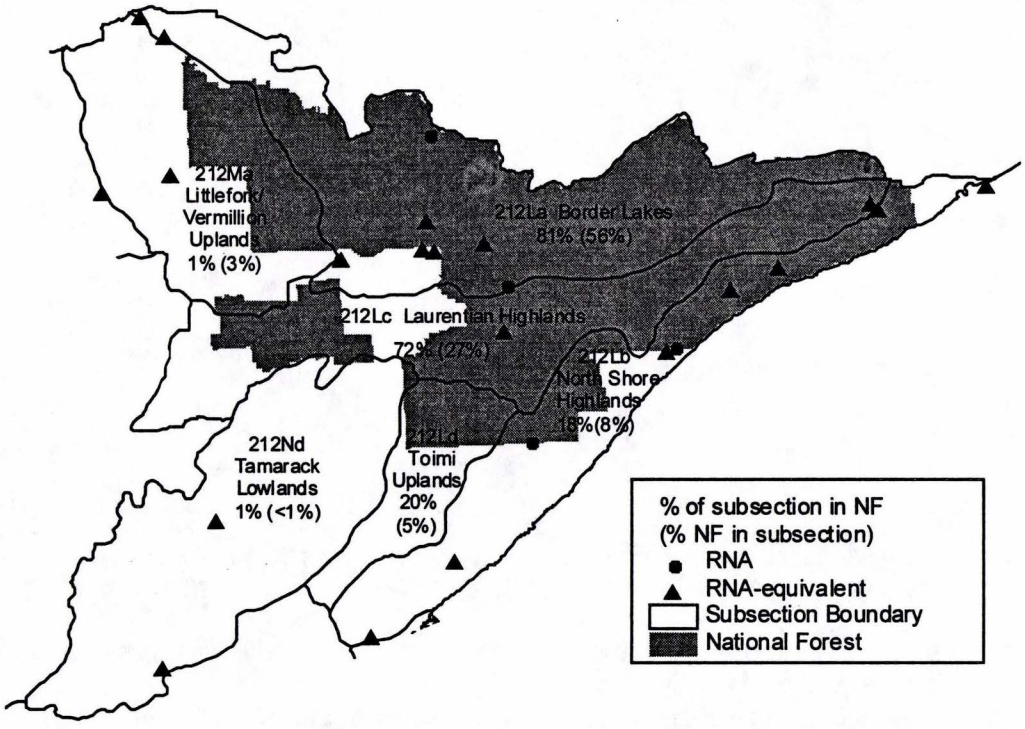


Superior Figure 2. The Superior National Forest with established RNAs, subsections, and the Boundary Waters Canoe Area Wilderness (BWCAW).
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the USFS. The entire BWCAW is shown here, but only the *unlogged* ("virgin") portion of the BWCAW, as defined in Heinselman (1996), is considered an RNA-equivalent in this assessment.

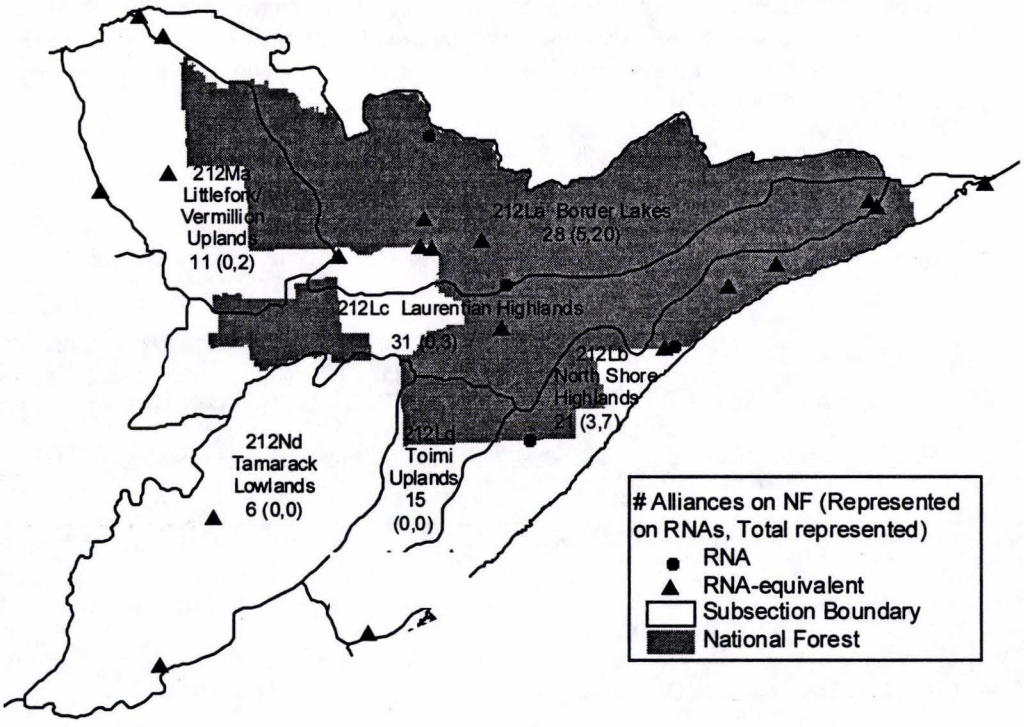


Superior Figure 3. Superior National Forest with RNAs, RNA-equivalents, and relationship to subsections.

The entire National Forest is shaded, though not all land in the shaded area is managed by the National Forest. In each subsection, the percentage of the subsection *managed* by the National Forest (*prominence)* is shown, followed (in parentheses) by the percentage of national forest land (managed) in the subsection.



Superior Figure 4. Alliance representation on subsections of the Superior National Forest. The entire Superior National Forest is shaded, though not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on national forest land, and in parentheses, the number of these represented by RNAs followed by the total number represented.



SUPERIOR APPENDICES

Superior Appendix A. Subsections of the Superior National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Superior Table 5 for information on the format of this table. The difference between these two tables is that Superior Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Superior Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances not Reported on NF Land**	--Subsections of Superior NF-- 212La (BL)		212Lc (LH)		212Ld (TU)		212Lb (NSH)		212Ma (LVU)		212Nd (TL)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Sugar Maple - American Basswood - (Red Oak) Forest Alliance					▪		▪					▪
White Oak - (Red Oak, Hickory species) Forest Alliance												▫
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Jack Pine - Oak (Northern Pin, Black) Forest Alliance		▪										
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance		▪						▫				
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance												▪
Black Spruce - Tamarack Saturated Forest Alliance		▪										
Bur Oak - Oak (White, Northern Pin, Black) Woodland Alliance		▪										
Canada Bluejoint Seasonally Flooded Herbaceous Alliance		▪										
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance		▪		▪		▪		▪		▪		▪
Hardstem Bulrush - (Softstem Bulrush) Semipermanently Flooded Herbaceous Alliance		▪										
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		▪										
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Green Ash - (American Elm) Forest Alliance												▫
Lowland Talus Sparse Vegetation		▫						▫				
Sand Flats Temporarily Flooded Sparse Vegetation		▪						▪				

Superior Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Superior National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection* 212La. *Border Lakes								
Matrix Alliances								
Jack Pine Forest Alliance		Boundary Waters CAW	50,100				AB	
Red Pine Forest Alliance	Lac La Croix		232	C	AB	A	B	
		Boundary Waters CAW	17,700				AB	
		Burntside Islands SNA	15	D	A	B	B	
		Eagle's Nest Island No. 4 SNA	4	D	AB	B	BC	
		Purvis Lake-Ober Foundation SNA	10	D	AB	B	BC	
White Pine - (Red Pine) - Quaking Aspen Forest Alliance		Boundary Waters CAW	0	U	AB	A	AB	
White Pine Forest Alliance	Lac La Croix		232	C	AB	A	B	
		Boundary Waters CAW	21,400				AB	
		Burntside Islands SNA	17	D	AB	B	BC	
		Kawishiwi Triangle SNA	29	D	AB	A	B	
White Spruce - Balsam Fir - Aspen Forest Alliance		Boundary Waters CAW	101,500				AB	
White Spruce - Balsam Fir Forest Alliance		Boundary Waters CAW	0	U	AB	A	AB	
		Burntside Islands SNA	16	D	AB	B	BC	
Quaking Aspen - Paper Birch Forest Alliance	Lac La Croix		309	C	AB	A	B	
		Boundary Waters CAW	61,000				AB	
		Burntside Islands SNA ?	16	D	AB	B	QBC	?
		Purvis Lake-Ober Foundation SNA ?	100	C	AB	B	QB	?
Large Patch Alliances								
Black Spruce Forest Alliance	Keeley Creek		420	C	A	A	B	
		Boundary Waters CAW	79,600				AB	
Northern White Cedar Forest Alliance		Boundary Waters CAW	17,700				AB	
		Purvis Lake-Ober Foundation SNA	4	D	AB	B	BC	
Paper Birch Forest Alliance		Boundary Waters CAW	0	U	AB	A	AB	
Black Spruce Saturated Forest Alliance	Keeley Creek		220	B	A	A	A	
		Boundary Waters CAW	33,200				AB	
		Lost Lake Peatland SNA	410	B	AB	B	B	
		Purvis Lake-Ober Foundation SNA	10	D	AB	B	BC	
Northern White Cedar Saturated Forest Alliance		Boundary Waters CAW	2,300				AB	
Black Ash - Red Maple Saturated Forest Alliance		Boundary Waters CAW	500				AB	
		Purvis Lake-Ober Foundation SNA	4	D	AB	B	BC	

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank ?
Tamarack Saturated Forest Alliance		Boundary Waters CAW	500				AB
Black Spruce Saturated Woodland Alliance		Boundary Waters CAW	9,500				AB
		Lost Lake Peatland SNA	1,915	A	AB	B	A
Speckled Alder Seasonally Flooded Shrubland Alliance		Boundary Waters CAW	11,400				AB
Leatherleaf Saturated Dwarf-Shrubland Alliance		Boundary Waters CAW	20,000				AB
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Boundary Waters CAW	0				AB
		Lost Lake Peatland SNA	411	B	AB	B	B
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		Boundary Waters CAW ?	3,600				QAB ?
Jack Pine / Lichen Nonvascular Alliance		Boundary Waters CAW	21,400				AB
Small Patch Alliances							
(Jack Pine, Red Pine) Woodland Alliance	Keeley Creek ?		0	U			QI ?
		Boundary Waters CAW	0	U	AB	A	AB
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance		Boundary Waters CAW	0				U
Bog Birch - (Willow) Saturated Shrubland Alliance		Purvis Lake-Ober Foundation SNA	4	D	AB	B	BC
Sedge spp. (Carex rostrata, C. utriculata) Seasonally Flooded Herbaceous Alliance		Purvis Lake-Ober Foundation SNA	3	D	AB	B	BC
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance		Boundary Waters CAW ?	3,600				QAB ?
		Border Lakes (212La) Total:	459,381				

Subsection 212Lc. *Laurentian Highlands*

Large Patch Alliances							
Black Spruce Saturated Woodland Alliance		Sand Lake Peatland SNA	2,273	A	AB	AB	A
Leatherleaf Saturated Dwarf-Shrubland Alliance		Sand Lake Peatland SNA	682	A	AB	AB	A
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Sand Lake Peatland SNA	1,365	A	AB	AB	A
		Laurentian Highlands (212Lc) Total:	4,320				

Subsection 212Ld. *Toimi Uplands*

		Toimi Uplands (212Ld) Total:					

Subsection 212Lb. *North Shore Highlands*

Matrix Alliances							
White Pine Forest Alliance		Hovland Woods SNA	3	D	AB	B	BC
White Spruce - Balsam Fir - Aspen Forest Alliance		Lutsen Natural Area SNA	25	D	AB	B	BC
White Spruce - Balsam Fir Forest Alliance		Hovland Woods SNA	82	C	AB	B	B
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	Marble Lake Lookout		60	C	A	B	B
	Schroeder		278	C	B	B	B
		Hovland Woods SNA	15	D	AB	B	BC
		Lutsen Natural Area SNA	450	C	AB	B	B
		Moose Mountain SNA	30	D	A	B	B
		Spring Beauty Northern Hardwoods SNA	25	C?	AB	B	B

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L	Rank ?
Quaking Aspen - Paper Birch Forest Alliance		Butterwort Cliffs SNA	0		U
		Lutsen Natural Area SNA	195	C AB B	B
Large Patch Alliances					
Northern White Cedar Forest Alliance		Hovland Woods SNA	20	C AB B	B
		Lutsen Natural Area SNA	50	B AB B	B
Paper Birch Forest Alliance	Marble Lake Lookout ?		8	C A B	QBC ?
Black Spruce Saturated Forest Alliance	Marble Lake Lookout		12	C A B	BC
Northern White Cedar Saturated Forest Alliance	Marble Lake Lookout		12	C A B	BC
	Schroeder		47	C A B	B
		Hovland Woods SNA	0	U AB B	U
Black Ash - Red Maple Saturated Forest Alliance	Marble Lake Lookout		28	C A B	B
Small Patch Alliances					
Open Bluff/Cliff Sparse Vegetation		Butterwort Cliffs SNA	0	U AB C	B
Open Pavement Sparse Vegetation		Butterwort Cliffs SNA	0	U AB C	B
		Sugarloaf Point SNA	2	D AB BC	BC
Cobble/Gravel Shore Sparse Vegetation		Sugarloaf Point SNA	1	D AB BC	BC
		North Shore Highlands (212Lb) Total:	1,343		

Subsection 212Ma. *Littlefork-Vermillion Uplands*

Large Patch Alliances					
Black Spruce Saturated Forest Alliance		Nett Lake Peatland SNA	370	B AB B	B
Tamarack Saturated Forest Alliance		East Rat Root River Peatland SNA	580	A AB AB	A
		West Rat Root River Peatland SNA	15	C AB B	B
Black Spruce Saturated Woodland Alliance		East Rat Root River Peatland SNA	1,450	A AB A	A
		West Rat Root River Peatland SNA	700	A AB B	A
Leatherleaf Saturated Dwarf-Shrubland Alliance		East Rat Root River Peatland SNA	602	B AB A	A
		West Rat Root River Peatland SNA	300	C AB B	B
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		West Rat Root River Peatland SNA	400	B AB B	B
Small Patch Alliances					
Bog Birch - (Willow) Saturated Shrubland Alliance		East Rat Root River Peatland SNA	0	U AB A	U
		West Rat Root River Peatland SNA ?	0	U AB B	QU ?
Wiregrass Sedge Saturated Herbaceous Alliance		East Rat Root River Peatland SNA	100	B AB A	A
		Nett Lake Peatland SNA	40	C AB B	B
		Littlefork-Vermillion Uplands (212Ma) Total:	4,557		

Subsection 212Nd. *Tamarack Lowlands*

Large Patch Alliances					
Black Spruce Saturated Woodland Alliance		Wawina Peatland SNA	2,159	A AB B	A
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance		McGregor Marsh SNA ?	400	B AB B?	QB ?

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous Alliance		Wawina Peatland SNA	285	B	AB	B	A	
Small Patch Alliances								
Wiregrass Sedge Saturated Herbaceous Alliance		Wawina Peatland SNA	815	A	AB	B	A	
		Tamarack Lowlands (212Nd) Total:	3,659					
		Grand Total:	473,260					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Superior Appendix C. Unrepresented alliances (Forest-wide) on the Superior National Forest

The following alliances are not represented in any of the subsections in which they occur on Superior National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- Eastern White Cedar - Yellow Birch Forest Alliance (large patch, endemic)
- Red Oak - Sugar Maple - (White Oak) Forest Alliance (large patch, peripheral)
- Silver Maple Temporarily Flooded Forest Alliance (large patch, peripheral)

The following alliances are reported not to be represented in any of the subsections in which they occur on Superior National Forest land, but might indeed occur on portions of the BWCAW (212La):

- Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance (large patch, widespread)
- Rock Outcrop/Butte Sparse Vegetation (large patch, widespread)
- Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance (small patch, widespread)
- Sedge species (*Carex rostrata*, *C. utriculata*) Seasonally Flooded Herbaceous Alliance (small patch, widespread)
- Wiregrass Sedge Saturated Herbaceous Alliance (small patch, widespread)
- Inland Strand Beach Sparse Vegetation (small patch, limited)
- Non-Tidal Mud Flat Seasonally/Temporarily Flooded Sparse Vegetation (small patch, peripheral)
- Bog Birch - (Willow) Saturated Shrubland Alliance (small patch, widespread)
- Wild Rice Species Semipermanently Flooded Herbaceous Alliance (small patch, limited)
- Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance (small patch, widespread)
- Cobble/Gravel Shore Sparse Vegetation (small patch, endemic)

IX. M. Wayne National Forest RNA Assessment

WAYNE SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the Wayne National Forest. An Executive Summary for the entire document is given on pages iv-vi.

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on Wayne National Forest land. The Wayne National Forest occupies portions of 5 subsections. Community data were not collected for 2 of these subsections (221Eg and 221Ea) because they have less than 1,000 acres of national forest land.

Based on data from the 3 dominant subsections, 19 alliances occur on Wayne National Forest lands, with about 16 alliances in each subsection. In these 3 subsections there are 47 subsection-alliance combinations; these are ecosystems to represent for the Wayne National Forest. The number of ecosystems may be higher, because community information in each subsection is possibly incomplete.

A critical review is needed of the table (matrix) listing the alliances in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

None of the Wayne National Forest Wayne alliance-subsection combinations (ecosystems) are represented by Reas Run RNA, the one Wayne RNA established as of January 1999. On the basis of our ranking approach, the one alliance on this RNA is not of sufficient quality to represent any ecosystem present. Buffalo Beats RNA was established in 1999 but was not included in this assessment.

Existing **RNA-equivalents** in the 3 subsections include:

- 7 Ohio State Nature Preserves, and
- 3 preserves of The Nature Conservancy.

These 10 RNA-equivalents currently represent 5 (11%) of the Wayne alliance-subsection combinations (ecosystems). The number of represented ecosystems is possibly larger because RNA-equivalent data are possibly incomplete. Identifying alliances in additional protected areas could quickly reduce the number of ecosystems to represent.

UNREPRESENTED ECOSYSTEMS

The Wayne National Forest has 42 ecosystems that are unrepresentated by RNAs or RNA-equivalents. Methods for filling these gaps include:

- obtaining more information about communities on existing RNA-equivalents,
- evaluating areas with other designations as possible RNA-equivalents,
- establishing additional RNAs on the Wayne National Forest, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, **high-priority subsections** for the Wayne National Forest are:

- East Hocking Plateau (221Ed) and
- Ohio Valley Lowland (221Ec).

These two subsection each have <10% prominence, as do all the subsections, but compared to Subsection 221Ef, they have very little of the biological diversity (fewer than 10% of the alliances) represented.

West Hocking Plateau (221Ef) is a **medium-high priority subsection**. A greater percentage (27%) of its alliances is represented, but it has the highest prominence (7%) and dominance (45%).

Low-priority subsections are the Lower Scioto River Plateau (221Eg) and Pittsburg Low Plateau (221Ea) because Wayne prominence is very low in these subsections.

If high priority is given to unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), there are 5 **high-priority alliances** (of 19 Wayne alliances). These may be high-priority in each subsection in which they occur. Three are not represented in *any* subsection in which they occur on Wayne land:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance
- Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
- White Oak - (Red Oak, Hickory species) Forest Alliance

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IX.M.1. INTRODUCTION

The Wayne National Forest is located in southeastern Ohio (Wayne Figure 1). Its proclamation boundaries and purchase unit boundaries contain 833,990 acres, with 227,003 acres (27%) of this land currently (FY97) managed by the Wayne. Although national forests may acquire more land within proclamation boundaries and purchase units, RNAs are not likely to be established on inholdings anytime in the near future. Therefore in this assessment we focus on lands managed by the USFS, which we call "national forest land" or "national forest ownership."

The Wayne is located in Province 221—Eastern Broadleaf Forest (Oceanic) Province. Minor acreage of the White Mountain National Forest also occurs in this Province (Overview Appendix IX). Other national forests in this Province, but outside the Eastern Region are the Chattahoochee (minor), Daniel Boone, and Jefferson (minor). Coordination can occur with these national forests at setting province-wide goals or priorities for representation.

IX.M.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the Wayne National Forest.

IX.M.2.a. Subsections

Steve Sutherland of the Ohio Field Office of the Conservancy provided us with a list of subsections occurring on the Wayne National Forest. He used the digital subsection map of Keys *et al.* (1995, 1:3,500,000) overlain by a digital copy of federal lands nationwide to estimate the amount of land in each subsection within Wayne proclamation boundaries. A more detailed digital forest map was not available.

We considered ownership acreage within each subsection as 27% of the acreage within proclamation boundaries, based on the ratio of ownership to proclamation acres for the entire Wayne National Forest (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percentage of national forest land (ownership) in each subsection, and the percentage of each subsection with national forest land (ownership).

The percentage of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence. The percentage of national forest land in a subsection gives an indication of the *dominance* of a subsection on the Wayne National Forest, and could also be used in setting priorities for RNA selection and establishment.

IX.M.2.b. Distribution of alliances among subsections

To create the list of alliances by subsection for Ohio, we first compiled the natural community occurrences recorded in Natural Heritage Program databases. The Natural Heritage names for the occurrences had already been translated to associations (one classification level below alliance), and they were reviewed by Greg Schneider of the Ohio Natural Heritage Database. We determined the subsection of each occurrence by overlaying a point map of the community occurrences (generated from latitude and longitude) on the digital subsection map of Keys *et al.* (1995). The "Owner Code" field was used to determine if the occurrence was on national forest land.

Because only a subset of community occurrences are documented in the Heritage database, we sent the community lists to Rosemarie Boyle, Wayne National Forest botanist, and Marilyn Ortt, who added

additional associations and alliances that occur in each subsection with national forest land, and those that occur on national forest land in the subsection. (The alliances that occur on Forest Service lands are the focus of the RNA assessment.)

IX.M.2.c. Identifying RNA-equivalents

Based on discussions with Steve Sutherland of The Nature Conservancy, Rosemarie Boyle of the Wayne National Forest, and Marilyn Ortt, for this assessment, we considered Ohio State Nature Preserves and TNC preserves to be RNA equivalents. Areas believed to be RNA-equivalents on this basis were identified using the Ohio Natural Heritage Database, and reviewed by Steve Sutherland and Marilyn Ortt. The RNA Committee of the Wayne National Forest can work with conservation partners to evaluate additional areas or designations for RNA-equivalency.

IX.M.2.d. Digitizing RNAs

The Wayne National Forest provided a USGS 7.5 minute (1:24,000 scale) topographical map with an outline of the RNA boundary. We hand-digitized the boundary lines using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of the Wayne RNA (Wayne Figure 2) in the projection used by the Wayne (UTM 17 NAD 27), or a Region-wide RNA cover at regional projections.

RNA-equivalents were available as a point coverage database from the Ohio Natural Heritage Database. The database was used by Steve Sutherland to identify subsection locations for each RNA-equivalent.

IX.M.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

The Establishment Record for Reas Run contains information about vegetation in the form of SAF cover types, with total acreage for each type. Additional vegetation description is included in the record, which allowed us to assign an alliance to each type. Our decisions were reviewed by Marilyn Ortt.

Our sources for community occurrences on Ohio State Nature Preserves and TNC Preserves were Element Occurrence records from the Ohio Natural Heritage Database. Total acreage for each SNA or Preserve also came from the Ohio Natural Heritage Database. Our results were reviewed in part by Marilyn Ortt and Greg Schneider. Questions remain on several of the Nature Preserves (Wayne Appendix B).

If we are very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in Wayne Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the Wayne National Forest; answered questions may result in additional represented alliance-subsection combinations.

IX.M.3. RESULTS

This section summarizes what alliance-subsections occur on the Wayne National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.M.3.a. Subsections on national forest land

The 5 subsections that occur on Wayne National Forest land are listed below (Wayne Figure 2). These subsections are listed in order of *prominence*, the percentage of the subsection on Wayne National Forest land (Wayne Table 4).

- West Hocking Plateau (221Ef)
- East Hocking Plateau (221Ed)
- Ohio Valley Lowland (221Ec)
- Lower Scioto River Plateau (221Eg)
- Pittsburg Low Plateau (221Ea)

Nearly half of the Wayne National Forest land occurs on the West Hocking Plateau (221Ef; 45% of national forest land; Wayne Table 4, Wayne Figure 3), and the Wayne manages 7% of the land in this subsection. Most of the remainder of the National Forest is divided between the Ohio Valley Lowland (222Ec; 29%) and the East Hocking Plateau (221Ed; 25%). However, the Wayne manages less than 5% of each of these subsections. The Wayne manages less than 1% of the Lower Scioto River Plateau (221Eg) and the Pittsburg Low Plateau (221Ea), and each subsection makes up less than 1% of the National Forest. Because of their very low percentages, community data are not available for these 2 subsections.

IX.M.3.b. Natural communities within subsections

A total of 53 alliances are reported to occur in the 5 subsections of the Wayne National Forest. Of these, 29 alliances occur in the 3 dominant subsections (221Ef, 221Ed, and 221Ec). Of these 29 alliances, 19 are known to occur on Wayne National Forest land in these 3 subsections (Wayne Table 5, first column). The 10 alliances not reported to occur on Wayne National Forest land in these 3 subsections, plus 24 alliances reported only in the 2 minor subsections, are listed in Wayne Appendix A.

Of the 19 alliances occurring on the Wayne National Forest, 4 are **matrix** alliances (see Wayne Table 5, first set of alliances), 7 are **large patch** (second set) and 8 are **small patch** (third set). (See "National Vegetation Classification".)

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list gives the number of alliances reported to occur on the Wayne land in each subsection:

- West Hocking Plateau (222Ef): 15 alliances (4 matrix, 4 large patch, 7 small patch)
- East Hocking Plateau (222Ed): 16 alliances (4 matrix, 5 large patch, 7 small patch)
- Ohio Valley Lowland (222Ec): 16 alliances (4 matrix, 6 large patch, 6 small patch)
- Lower Scioto River Plateau (221Eg) *unknown*
- Pittsburg Low Plateau (221Ea) *unknown*

There are a total of 47 subsection-alliance combinations (ecosystem to represent) on Wayne National Forest land in the 3 dominant subsections. Wayne Table 5 shows the alliances that occur in each subsection.

IX.M.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Current representation of alliance-subsection combinations occurs in one RNA and several RNA-equivalents.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and all RNA-equivalents in each subsection are shown in the appropriate cells of Wayne Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see Wayne Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

As of January 1999, the Wayne National Forest had established 1 Research Natural Area (Reas Run RNA; 77 acres; Wayne Table 1, 6), and 2 candidate RNAs (cRNAs). Since that time, Buffalo Beats RNA has been established, but the assessment was not updated to reflect any alliances represented on that RNA. Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

A digital cover of the established RNA on the Wayne National Forest (Wayne Figure 2) is available in the projection used by the Wayne (UTM 17 NAD 27) from the Regional RNA Coordinator. A Regional RNA cover at a regional projection is also available.

RNA-equivalents

Discussions with Steve Sutherland of The Nature Conservancy, Rosemarie Boyle of the Wayne National Forest, and Marilyn Ortt led us to include the following areas as RNA-equivalents (Wayne Table 2):

- all State Nature Preserves and
- all of The Nature Conservancy's (TNC's) preserves.

Fifteen Ohio State Nature Preserves and 4 TNC preserves are RNA-equivalents for the Wayne National Forest assessment (Wayne Table 6, 7a). Community data for RNA-equivalents are incomplete, so there is likely to be a higher number of represented ecosystems than indicated below.

Wayne National Forest personnel can work with conservation partners to find additional areas and designations for RNA-equivalents using the Level I criterion or other criteria on which they agree.

West Hocking Plateau (Subsection 221Ef)

Subsection 221Ef contains no RNAs, but does contain 2 Ohio State Nature Preserves (Wayne Figure 3, Wayne Tables 6, 7a):

- Lake Katherine State Nature Preserve
- Rockbridge State Nature Preserve (100)

and 2 TNC preserves, covering 92 acres:

- Baker Swamp Preserve (62)
- Keystone Nature Preserve (30).

The 192 acres of RNA-equivalent land area shown in Wayne Table 7a is an underestimate, because acreage information was not available for Lake Katherine. Using the underestimated figure, 0.01% of the subsection is protected by RNA-equivalents (Wayne Table 7a).

Natural Communities (Alliances)

Of 15 alliances reported to be on Wayne National Forest land in Subsection 221Ef, 4 are represented by a high-quality (A- or B-ranked) occurrence in at least one RNA-equivalent (Wayne Table 5, column 221Ef; Wayne Table 7b; Wayne Figure 4).

One of the 4 matrix alliances, 1 of the 4 large patch alliances, and 2 of the 9 small patch alliances are represented.

One unrepresented matrix alliance and 1 unrepresented small patch alliance have low-quality occurrences on Rockbridge State Nature Preserve:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance (matrix)
- Open Bluff/Cliff Sparsely Vegetated Alliance (small patch).

East Hocking Plateau (Subsection 221Ed)

Subsection 221Ed contains no RNAs, but does contain 2 Ohio State Nature Preserves (Wayne Figure 3, Wayne Tables 6, 7a):

- Emerald Hills State Nature Preserve
- O.E. Anderson Compass Plant Prairie.

We do not have acreage for these preserves.

Natural Communities (Alliances)

None of the 16 alliances reported to be on Wayne National Forest land in Subsection 221Ed are currently represented by high-quality (A- or B-ranked) occurrences in one of the Nature Preserves (Wayne Table 5, column 221Ed; Wayne Table 7b; Wayne Figure 4). Thus, the 4 matrix alliances, 5 large patch alliances, and 7 small patch alliances are unrepresented. If additional alliances on the Ohio State Nature Preserves are identified, representation may be increased.

Ohio Valley Lowland (Subsection 221Ec)

Subsection 221Ec contains 1 RNA, covering 77 acres (Wayne Figure 3, Wayne Tables 6, 7a):

- Reas Run RNA.

The subsection also contains 3 Ohio State Nature Preserves, together covering 857 acres:

- Acadia Cliffs State Nature Preserve (277)
- Boord State Nature Preserve (89)
- Marie J. Desonier Nature Preserve (491)

and 1 TNC preserve, covering 276 acres:

- Tefft Memorial Nature Preserve.

Thus, 1,210 acres (0.05%) of the subsection are protected by RNAs and RNA-equivalents (Wayne Table 7a).

Natural Communities (Alliances)

Of 16 alliances reported to be on Wayne National Forest land in Subsection 221Ec, 1 is represented by a high-quality (A- or B-ranked) occurrence in an RNA-equivalent (Wayne Table 5, column 221Ec; Wayne Table 7b; Wayne Figure 4).

One of the 5 large patch alliances is represented, but none of the 4 matrix alliances or 7 small patch alliances are represented.

Three unrepresented matrix alliances and 1 unrepresented small patch alliance have low-quality occurrences on RNAs or RNA-equivalents:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance (matrix, Reas Run RNA)
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance (matrix, Marie J. Desonier State Nature Preserve)

- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix, Marie J. Desonier State Nature Preserve)
- Open Bluff/Cliff Sparsely Vegetated Alliance (small patch, Acadia Cliffs State Nature Preserve).

Lower Scioto River Plateau (221Eg)

Subsection 221Eg contains no RNAs, but it does contain 6 Ohio State Nature Preserves:

- Allen F. Beck Nature Preserve
- Christmas Rocks Nature Preserve (415)
- Conkles Hollow Nature Preserve
- Little Rocky Hollow Nature Preserve
- Rhododendron Cove Nature Preserve
- Sheick Hollow Nature Preserve

Total acreage is known only for one of these preserves.

Natural Communities (Alliances)

We have no information about alliances on Wayne National Forest land in this subsection. Thus representation goals are still undefined.

Pittsburg Low Plateau (221Ea)

Subsection 221Ea contains no RNAs, but it does contain 2 Ohio State Nature Preserves:

- Clear Fork Gorge
- Little Beaver Creek

and 1 TNC preserve:

- Rothenbuhler Woods (44).

Total acreage is known only for the TNC preserve.

Natural Communities (Alliances)

We have no information about alliances on National Forest land in this subsection. Thus representation goals are still undefined.

IX.M.3.d. Synthesis: Needs for Ecosystem Representation

The following table summarizes the representation of alliances by subsections for the Wayne National Forest. It also lists our suggested priority ranking of the subsections based on prominence and the representation of biological variation (percentage of alliances represented). The percentage of national forest land and percentage of acres represented in each subsection was not used to prioritize the subsections, though the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in Wayne Table 5 by shaded cells that contain no number. Alliances that are not represented in any Wayne subsection (unrepresented Forest-wide) are listed in Wayne Appendix C.

Subsection	Dominance Percentage of Wayne NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on Wayne NF lands	Percentage of NF alliances represented	Proposed priority
East Hocking Plateau (221Ed)	25	0	4	0	high
Ohio Valley Lowland (221Ec)	29	0.05	3	6	high
West Hocking Plateau (221Ef)	45	0.01	7	27	med-high
Lower Scioto River Plateau (221Eg)	0.1	0.04	0.02	*unknown*	low
Pittsburg Low Plateau (221Ea)	0.3	0.0005	0.01	*unknown*	low

Prominence is similar (3-7%) for the 3 dominant subsections, so priority ranking depends mostly on the degree of representation. With fewer than 10% of their alliances represented, Subsections 221Ed and 221Ec are high priority. Subsection 221Ef is less of a priority because more of its alliances are represented. However, if dominance (percent of Wayne NF in the subsection) is considered, 221Ef is high priority as it is 45% of Wayne National Forest.

With low prominence, Subsections 221Eg and 221Ea are low priority. However, they should be evaluated for special land type or other ecological features before deciding if little or no representation should occur.

The subsections in the remainder of this section are listed in order of proposed priority rather than prominence. Unrepresented alliances are either not present on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented.

East Hocking Plateau (Subsection 221Ed)

None of the 16 alliances in this subsection are represented (Wayne Figure 4). The 4 matrix alliances may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance
- Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance.
- White Oak - (Red Oak, Hickory species) Forest Alliance

Some alliances may be represented if high-quality alliances are identified on the Emerald Hills State Nature Preserve, for which we have no community data.

Ohio Valley Lowland (Subsection 221Ec)

Of 16 alliances, 1 is represented, leaving 15 alliances (94%) in need of representation (Wayne Figure 4). The 4 unrepresented matrix alliances may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance*
- Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
- Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance*
- White Oak - (Red Oak, Hickory species) Forest Alliance.*

The 3 marked (*) alliances have low-quality occurrences on an RNA or RNA-equivalent (Wayne Table 7b, Wayne Appendix B). The quality/viability of these occurrences should be verified. One unrepresented small patch alliance has a low-quality occurrence on Acadia Cliffs State Nature Preserve and its quality/viability should be verified:

- Open Bluff/Cliff Sparsely Vegetated Alliance.

West Hocking Plateau (Subsection 222Ef)

Of 15 alliances, 4 are represented, leaving 11 alliances (73%) in need of representation (Wayne Figure 4). The 3 unrepresented matrix alliances may be the highest priority for RNA establishment:

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance*
- Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
- White Oak - (Red Oak, Hickory species) Forest Alliance.

The marked (*) alliance has a low-quality occurrence on Rockbridge State Nature Preserve (Wayne Table 7b, Wayne Appendix B). The quality/viability of this occurrence should be verified. One unrepresented small patch alliance also has a low-quality occurrence on Rockbridge and its quality/viability should be verified:

- Open Bluff/Cliff Sparsely Vegetated Alliance.

Minor subsections

No information is available for the remaining subsections:

- Lower Scioto River Plateau (221Eg)
- Pittsburg Low Plateau (221Ea)

The Wayne National Forest manages very small amounts of land in each of these subsections (estimated at 268 acres and 750 acres, respectively). They should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

WAYNE TABLES

Wayne Table 1. Established research natural areas (RNAs) of the Wayne National Forest

RNA	Acres	Subsection	Established
Reas Run RNA	77	221Ec	1975

Wayne Table 2. Designations identified to date as RNA-equivalents for the Wayne National Forest

Protected Area Designation	Managed by
Ohio State Nature Preserves	Ohio Department of Natural Resources, Division of Natural Areas and Preserves
Nature Preserves	The Nature Conservancy

Wayne Table 3. Protected area designations not fully evaluated for RNA-equivalency for the Wayne National Forest

The Wayne may work with these organizations to consider RNA-equivalency (see Methods).

Protected Area Designation	Managed by
Special Areas, Wilderness	USDA Forest Service (Wayne National Forest)
Private Nature Preserves	Private agencies other than The Nature Conservancy
University preserves	Universities

Wayne Table 4. Subsections of the Wayne National Forest, in order of prominence

"NF acres" is the number of acres on national forest land (ownership) in the subsection. "Prominence" is the percentage of the subsection on national forest lands (NF acres/Total subsection acres); these percentages do not add to 100. "Domiance" is NF acres divided by Wayne total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also Wayne Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF land in subsection
221Ef. West Hocking Plateau	1,424,566	102,860	7%	45%
221Ed. East Hocking Plateau	1,606,265	57,547	4%	25%
221Ec. Ohio Valley Lowland	2,264,416	65,578	3%	29%
221Eg. Lower Scioto River Plateau	1,112,667	268	0.02%	0.1%
221Ea. Pittsburg Low Plateau	9,775,711	750	0.01%	0.3%
	Wayne total ownership:	227,003		

Wayne Table 5. Subsections and alliances reported on Wayne National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (Wayne Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) WHP= West Hocking Plateau, EHP= East Hocking Plateau, OVL= Ohio Valley Lowland. Less than 1,000 acres of the Wayne are found in the Lower Scioto River Plateau (221Eg) and Pittsburg Low Plateau (221Ea), subsections for which we have no community data. For a list of alliances occurring in subsections of the Wayne NF subsections but not reported on NF land, see Wayne Appendix A. For alliance nomenclature, see Overview Appendix IV.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances Reported on NF Land**	Subsections of Wayne NF: 221Ef (WHP)		221Ed (EHP)		221Ec (OLV)		221Eg* (LSR)		221Ea* (PLP)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	▪	(1)	▪		▪	1	▪		▪	
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance	▪		▪		▪		(1) ▪		▪	
Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance	(1) ▪	(1)	▪		▪	(1)	▪	(1)	(1) ▪	
White Oak - (Red Oak, Hickory species) Forest Alliance	▪		▪		▪	(1)	▪		▪	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance	(1) ▪		▪		(1) ▪	(1)	▪		▪	
Eastern White Pine - Eastern Hemlock Forest Alliance					▪				▪	
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance					▪					
Red Oak - Sugar Maple - (White Oak) Forest Alliance	▪		▪		▪		▪		▪	(1)
Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance	▪		▪		▪					
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance	▪		▪		▪		▪		▪	
Silver Maple Temporarily Flooded Forest Alliance	▪		▪		▪		▪		▪	
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Virginia Pine - (Scarlet Oak, Rock Chestnut Oak) Forest Alliance	▪		▪		▪		▪			
River Birch - (Sycamore) Temporarily Flooded Forest Alliance	▪		▪		▪		▪		▪	

*We were unable to obtain data about alliances on national forest land in these subsections.

Community Pattern **Alliances Reported on NF Land**	Subsections of Wayne NF				
	221Ef (WHP)	221Ed (EHP)	221Ec (OLV)	221Eg* (LSR)	221Ea* (PLP)
Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance	▪	▪			
Buttonbush Semipermanently Flooded Shrubland Alliance	(1) ▪	▪	▪		▪
Narrow-Leaf Willow Temporarily Flooded Shrubland Alliance	▪	▪	▪		
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance	(1) ▪	▪	▪		▪
Common Water-willow Temporarily Flooded Herbaceous Alliance	▪	▪	▪		
Open Bluff/Cliff Sparse Vegetation	▪(1)	▪	▪ (1)	▪	▪

*We were unable to obtain data about alliances on national forest land in these subsections.

Wayne Table 6. RNAs and RNA-equivalents of the Wayne National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsec-tion	RNA (acres)	RNA-Equivalent (acres)	
		Ohio State Nature Preserve	TNC Preserve
221Ef		• Lake Katherine • Rockbridge (100)	• Baker Swamp (62) • Keystone (30)
221Ed		• Emerald Hills • O.E. Anderson Compass Plant Prairie	
221Ec	• Reas Run RNA (77)	• Acadia Cliffs (277) • Boord (89) • Marie J. Desonier (491)	• Tefft Memorial (276)
221Eg		• Allen F. Beck • Christmas Rocks (415) • Conkles Hollow • Little Rocky Hollow • Rhododendron Cove • Sheick Hollow	
221Ea		• Clear Fork Gorge • Little Beaver Creek	• Rothenbuhler Woods (44)

Wayne Table 7. Summary of subsection representation on the Wayne National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percent of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off National Forest land. *? = unknown*

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
221Ef. West Hocking Plateau		4		192	192 *<1%*
221Ed. East Hocking Plateau		2		*?*	*?*
221Ec. Ohio Valley Lowland	1	4	77	1,133	1,210 *<1%*
221Eg. Lower Scioto River Plateau		6		415	415 *<1%*
221Ea. Pittsburg Low Plateau		3		44	44 *<1%*
TOTAL	1	19	77	1,784	1,861 *<1%*

7b. Number and percent of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for representation"). Alliances with only D-ranked occurrences are not counted. *? = unknown*

Subsection	# Alliances on NF land	Alliance representation			Low-quality*
		RNA	RNA-eq	Total**	
221Ef. West Hocking Plateau	15		4 *27%*	4 *27%*	2
221Ed. East Hocking Plateau	16			0*?*	
221Ec. Ohio Valley Lowland	16	0	1 *6%*	1 *6%*	4
221Eg. Lower Scioto River Plateau	*?*			*?*	
221Ea. Pittsburg Low Plateau	*?*			*?*	

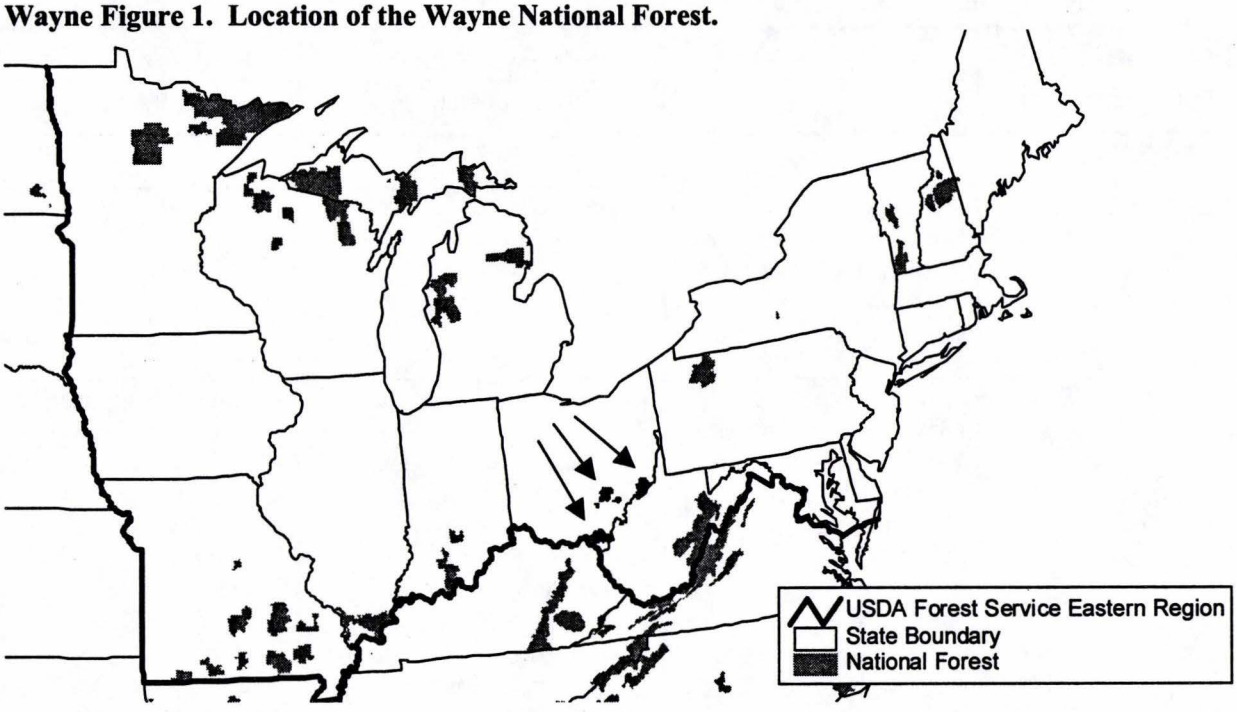
* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

Wayne Table 8. Alliances of the Wayne National Forest arranged by community pattern and community distribution

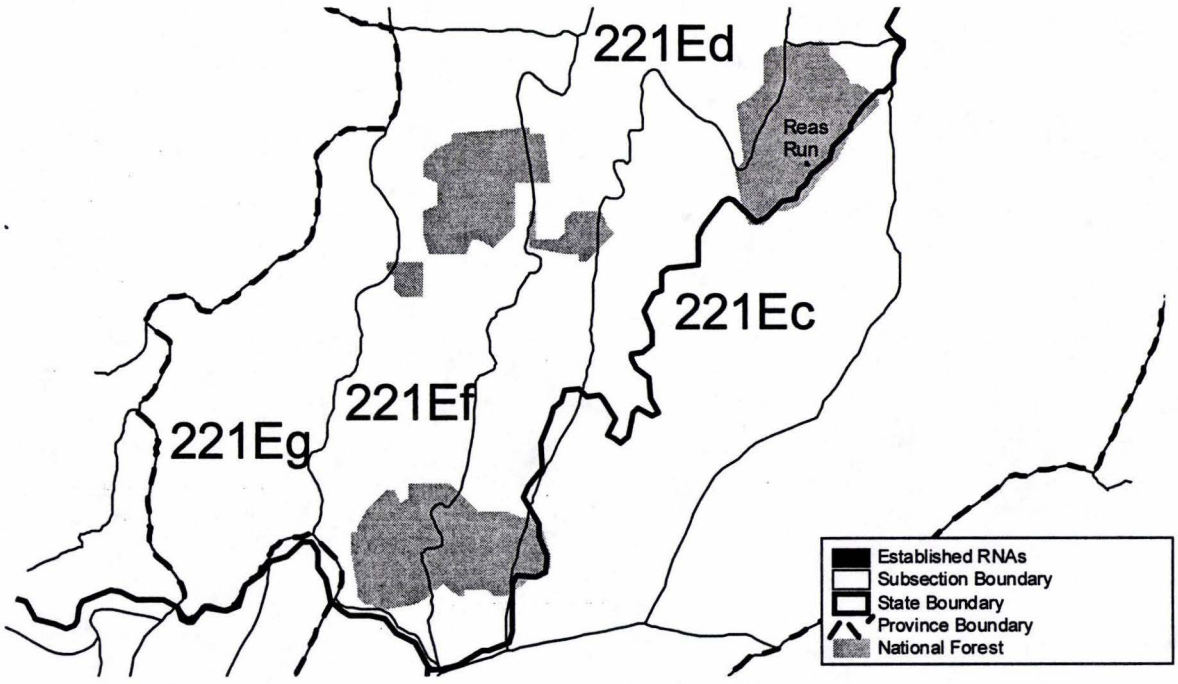
COMMUNITY DISTRIBUTION	COMMUNITY PATTERN		
	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC			
LIMITED	•American Beech - Sugar Maple - (Tuliptree) Forest •Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest	•Eastern White Pine - Eastern Hemlock Forest	
WIDESPREAD	•Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest •White Oak - (Red Oak, Hickory species) Forest	•Eastern Hemlock - Yellow Birch Forest •Pin Oak - (Swamp White Oak) Seasonally Flooded Forest •Red Oak - Sugar Maple - (White Oak) Forest •Silver Maple Temporarily Flooded Forest •White Pine - (White Oak, Red Oak, Black Oak) Forest	•Buttonbush Semipermanently Flooded Shrubland •Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous •Common Water-willow Temporarily Flooded Herbaceous •Narrow-Leaf Willow Temporarily Flooded Shrubland •Open Bluff/Cliff Sparsely Vegetated •River Birch - (Sycamore) Temporarily Flooded Forest •Virginia Pine - (Scarlet Oak, Rock Chestnut Oak) Forest
PERIPHERAL		•Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest	•Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous

WAYNE FIGURES

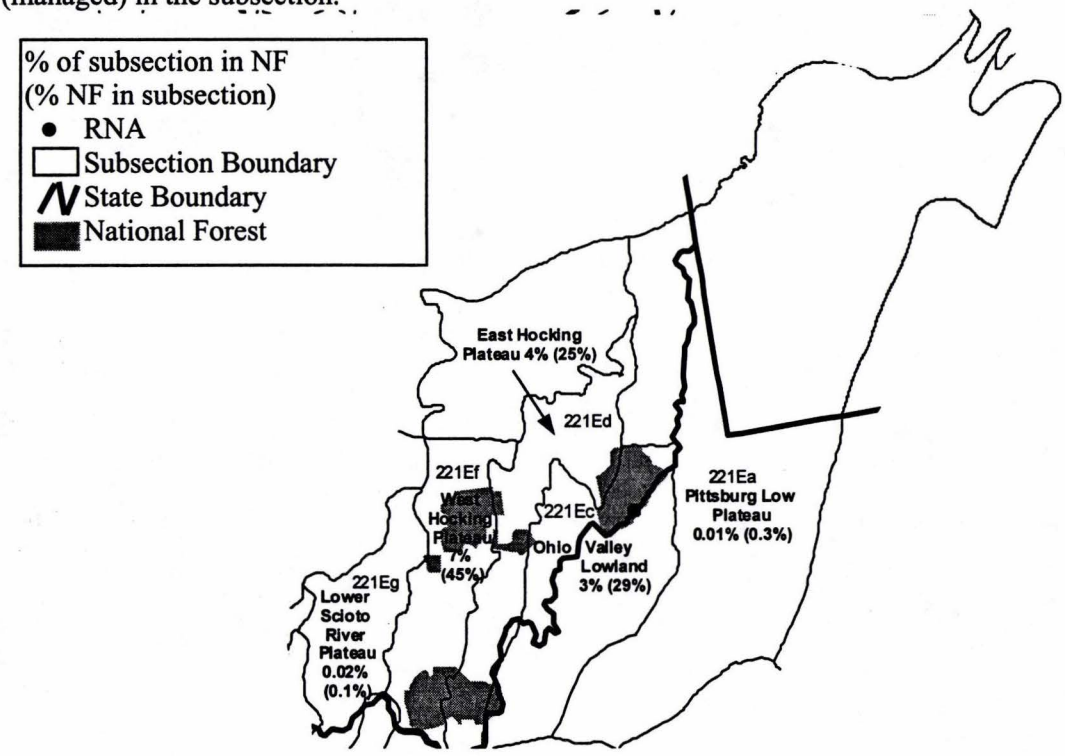
Wayne Figure 1. Location of the Wayne National Forest.



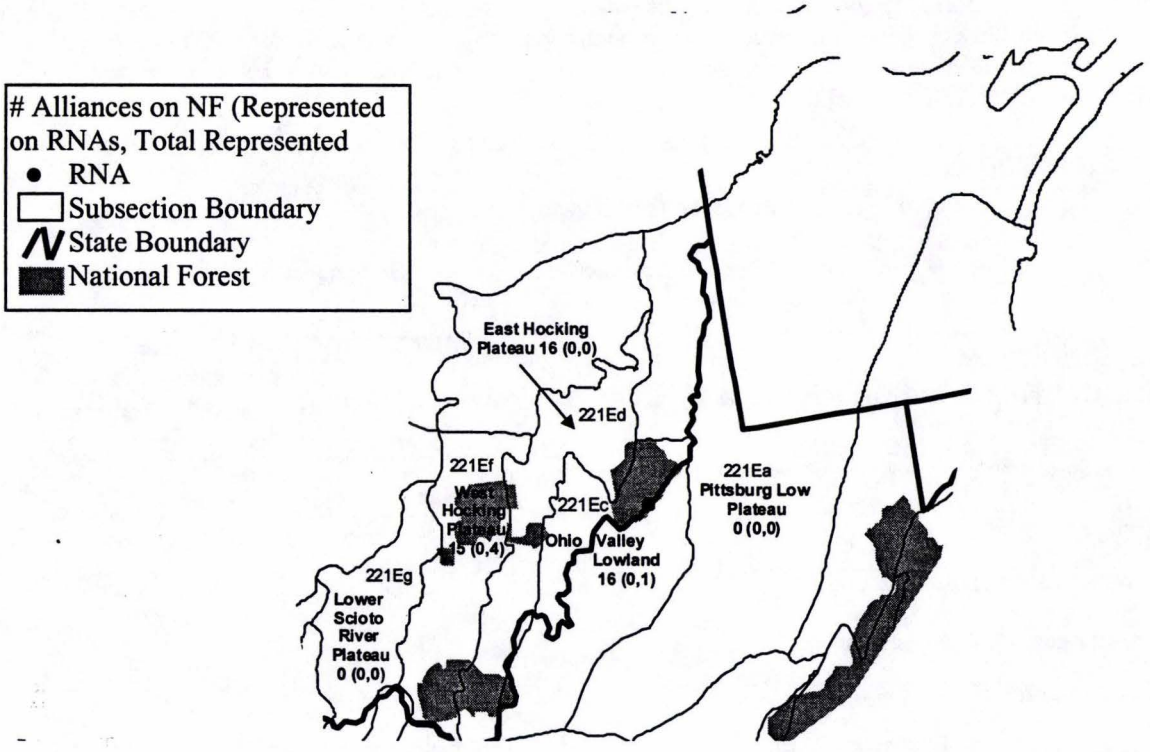
Wayne Figure 2. The Wayne National Forest with established RNAs and subsections
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



Wayne Figure 3. Wayne National Forest in relation to subsections.
The entire Wayne National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the percentage of the subsection *managed* by the Wayne National Forest (*prominence)* is shown, followed (in parentheses) by the percentage of Wayne National Forest land (managed) in the subsection.



Wayne Figure 4. Alliance representation on subsections of the Wayne National Forest. The entire Wayne National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection is shown the number of alliances occurring on Wayne National Forest land, and in parentheses, the number of these represented by RNAs only followed by the total



WAYNE APPENDICES

Wayne Appendix A. Subsections of the Wayne National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See Wayne Table 5 for information on the format of this table. The difference between these two tables is that Wayne Table 5 lists Alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of Wayne Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	▪ Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances not Reported on NF Land**	Subsections of Wayne NF: 221Ef (WHP)		221Ed (EHP)		221Ec (OVL)		221Eg (LSR)		221Ea (PLP)	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance										▪
American Beech - White Oak Forest Alliance										▪
Black Oak - White Oak Forest Alliance										▪
Sugar Maple - Chinquapin Oak Forest Alliance										▪
Sugar Maple - White Ash - American Basswood Forest Alliance										▪
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance										▫
American Beech Temporarily Flooded Forest Alliance								▪		
Eastern Cottonwood Temporarily Flooded Forest Alliance										▪
Red Maple - Green Ash Seasonally Flooded Forest Alliance		▪		▫						▪
Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance		▪		▪		▪		▪		
Red Maple - Black Gum Saturated Forest Alliance										▪
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance										▫
Pitch Pine - (Black Oak, Rock Chestnut Oak) Forest Alliance		▪						▪		
Black Willow Temporarily Flooded Forest Alliance		▫		▫		▪				
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance										▪
Eastern Hemlock Saturated Forest Alliance										▫
Red Spruce - Red Maple Saturated Forest Alliance										▪

Community Pattern **Alliances not Reported on NF Land**	Subsections of Wayne NF 221Ef (WHP)	221Ed (EHP)	221Ec (OVL)	221Eg (LSR)	221Ea (PLP)
Black Ash - Red Maple Saturated Forest Alliance					▫
Black Willow Temporarily Flooded Shrubland Alliance	▫	▫	▫		▪
Red Osier Dogwood - Willow Seasonally Flooded Shrubland Alliance					▪
River Birch Temporarily Flooded Shrubland Alliance					▪
Smooth Alder Seasonally Flooded Shrubland Alliance	▪	▪	▪		
Smooth Alder Temporarily Flooded Shrubland Alliance					▫
Little Bluestem - Indian Grass Herbaceous Alliance		▪ (1)		▪	▪
Canada Bluejoint Seasonally Flooded Herbaceous Alliance					▪
Tussock Sedge Seasonally Flooded Herbaceous Alliance					▫
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance			▪	▪	▫
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance					▫
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance					▫
Golden-saxifrage Saturated Herbaceous Alliance					▫
Skunk Cabbage - Marsh Marigold Saturated Herbaceous Alliance			▪		
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance					▫
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance	(1) ▪				
Yellow Water Lily - White Water Lily Permanently Flooded Herbaceous Alliance	▪	▫			▪

Wayne Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the Wayne National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S C L Rank	?
Subsection 221Ef. West Hocking Plateau					
Matrix Alliances					
American Beech - Sugar Maple - (Tuliptree) Forest Alliance		Rockbridge State Nature Preserve	20	CD C BC BC	
Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance		Keystone Nature Preserve		U C BC BC	
		Lake Katharine State Nature Preserve	10	CD A BC B	
Large Patch Alliances					
Eastern Hemlock - Yellow Birch Forest Alliance		Lake Katharine State Nature Preserve	20	C A BC B	
Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance		Baker Swamp Preserve		U U BC U	
Small Patch Alliances					
Buttonbush Semipermanently Flooded Shrubland Alliance		Baker Swamp Preserve		U A BC B	
Cattail species - (Bulrush species, Rush species) Seasonally Flooded Herbaceous Alliance		Baker Swamp Preserve		U A BC B	
Pondweed - Hornwort - Waterweed Permanently Flooded Herbaceous Alliance		Baker Swamp Preserve		U B BC B	
Open Bluff/Cliff Sparse Vegetation		Rockbridge State Nature Preserve	3	C C BC BC	
		West Hocking Plateau (221Ef) Total:	53		
Subsection 221Ed. East Hocking Plateau					
Small Patch Alliances					
Little Bluestem - Indian Grass Herbaceous Alliance		O.E. Anderson Compass Plant Prairie	16	B BC C BC	
		East Hocking Plateau (221Ed) Total:	16		
Subsection 221Ec. Ohio Valley Lowland					
Matrix Alliances					
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Reas Run		42	D AB B BC	
Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance		Marie J. Desonier Nature Preserve	25	CD C BC C	
White Oak - (Red Oak, Hickory species) Forest Alliance		Marie J. Desonier Nature Preserve	7	D C BC C	
Large Patch Alliances					
Eastern Hemlock - Yellow Birch Forest Alliance		Boord State Nature Preserve	6	C B BC B	
		Tefft Memorial Nature Preserve	5	C C BC BC	
Small Patch Alliances					

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Open Bluff/Cliff Sparse Vegetation		Acadia Cliffs State Nature Preserve		U	C	BC	BC	
		Ohio Valley Lowland (221Ec) Total:	85					

Subsection 221Eg. *Lower Scioto River Plateau*

Matrix Alliances

Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance		Christmas Rocks State Nature Preserve	84	C	AB	BC	B	
Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance		Christmas Rocks State Nature Preserve	9	CD	C	BC	BC	

Large Patch Alliances

American Beech Temporarily Flooded Forest Alliance		Christmas Rocks State Nature Preserve	11	U		BC	U	
		Lower Scioto River Plateau (221Eg) Total:	104					

Subsection 221Ea. *Pittsburg Low Plateau*

Matrix Alliances

Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance		Rothenbuhler Woods Nature Preserve		U	B	BC	B	

Large Patch Alliances

Red Oak - Sugar Maple - (White Oak) Forest Alliance		Little Beaver Creek State Nature Preserve	10	C	C	BC	C	
		Pittsburg Low Plateau (221Ea) Total:	10					
		Grand Total:	268					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

Wayne Appendix C. Forest-wide unrepresented alliances

The following alliances are not represented in any of the subsections in which they occur on Wayne National Forest land, and may therefore be a priority to represent in at least one subsection. The community pattern and community distribution of alliances is given in parentheses.

- American Beech - Sugar Maple - (Tuliptree) Forest Alliance (matrix, limited)
- Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance (matrix, widespread)
- White Oak - (Red Oak, Hickory species) Forest Alliance (matrix, widespread)
- Eastern White Pine - Eastern Hemlock Forest Alliance (large patch, limited)
- Red Oak - Sugar Maple - (White Oak) Forest Alliance (large patch, widespread)
- Pin Oak - (Swamp White Oak) Seasonally Flooded Forest Alliance (large patch, widespread)
- Silver Maple Temporarily Flooded Forest Alliance (large patch, widespread)
- Green Ash - American Elm - (Hackberry, Sugarberry) Temporarily Flooded Forest Alliance (large patch, peripheral)
- Virginia Pine - (Scarlet Oak, Rock Chestnut Oak) Forest Alliance (small patch, widspread)
- White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance (small patch, widespread)
- River Birch - (Sycamore) Temporarily Flooded Forest Alliance (small patch, widespread)
- Narrow-Leaf Willow Temporarily Flooded Shrubland Alliance (small patch, widespread)
- Common Water-willow Temporarily Flooded Herbaceous Alliance (small patch, widespread)
- Open Bluff/Cliff Sparsely Vegetated Alliance (small patch, widespread)
- Little Bluestem - (Oatgrass species) Deciduous Wooded Herbaceous Alliance (small patch, peripheral)

IX. N. White Mountain National Forest RNA Assessment

WHITE MOUNTAIN SUMMARY

This section summarizes the portions of the RNA assessment pertaining to the White Mountain National Forest. An Executive Summary for the entire document is given on pages iv-vi. **The White Mountain portion of the assessment is preliminary, as not all aspects of the assessment were conducted.**

ECOSYSTEMS TO REPRESENT

We summarize which ecosystems (subsections and alliances) occur on White Mountain National Forest lands. The White Mountain National Forest occupies portions of 6 subsections, but the assessment was conducted only for the Subsection M212Ad (White Mountain Subsection). Eighty-two (82) percent of the National Forest occurs in this subsection. In this subsection, 36 alliances occur on White Mountain National Forest lands; these are the currently identified ecosystems to represent for the White Mountain National Forest.

A critical review is needed of the table (matrix) listing alliances possibly occurring in each subsection to verify which alliances occur on national forest land and which alliance-subsection combinations (ecosystems) are represented and unrepresented. Of particular importance is verifying which alliances (not identified by this assessment) occur in the 5 subsections that have land within national forest boundaries that this assessment unfortunately did not include. During this review, the list of ecosystems to represent can be modified or condensed for either ecological or administrative reasons. In addition, unrepresented ecosystems (gaps and needs for additional RNAs) can be prioritized and integrated with other resource needs on the Forest.

CURRENT REPRESENTATION OF ECOSYSTEMS

Seven of the 36 alliances in Subsection M212Ad are represented by the 3 currently established White Mountain RNAs.

Existing **RNA-equivalents** in this subsection include:

- 1 Nature Conservancy preserve

The identification of RNA-equivalents is not complete in this subsection.

The one identified RNA-equivalent represents an additional alliance, for a total of 8 (22% of the 36 alliances occurring in this subsection).

UNREPRESENTED ECOSYSTEMS

The White Mountain National Forest has 28 alliances unrepresentated by RNAs or RNA-equivalents in Subsection M212Ad.

Unrepresented ecosystems (alliance-subsection combinations) in the other 5 subsections have not yet been determined.

Methods for filling gaps in representation include:

- determining ecosystems to represent in the 5 minor subsections
- obtaining more information about communities on existing RNA-equivalents
- evaluating areas with other designations as possible RNA-equivalents

- establishing new RNAs, and
- working with conservation partners to create new RNA-equivalents.

POSSIBLE PRIORIES FOR ADDRESSING GAPS IN REPRESENTATION

Based on assigning high priority to unrepresented alliances in those subsections that have a high prominence (high percentage of subsection land area that is national forest), and to those subsections in which representation of biological diversity (alliances) is low, the **high-priority subsection** for the White Mountain National Forest is:

- M212Ad (White Mountain subsection)

The White Mountain has high prominence (> 75%) in this subsection, and fewer than 25% of the alliances are represented.

The **medium-priority subsection** is M212Ae (Mahoosuc Rangely Lakes). Prominence is lower (5%), but the level of alliance representation is unknown. All other subsections are **low priority** - M212Bc (Sunapee Uplands), M212Ba (Vermont Piedmont), M212Ag (Western Maine Foothills), and 221Al (Sebago-Ossipee Hills and Plains) - because prominence is < 5 %. Nevertheless, they should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

High priority could be given to representing unrepresented alliances that cover(ed) extensive, unfragmented areas of the landscape (matrix alliances), once alliance distribution in the subsections other than M212Ad is determined for national forest land. Matrix alliances in M212Ad have been represented.

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IX.N.1. INTRODUCTION

This document presents the White Mountain National Forest portion of the Regional RNA Assessment. Portions of the Overview are summarized here, but with information specific to the White Mountain National Forest. **This report is preliminary, as not all aspects of the assessment could be thoroughly conducted.**

The White Mountain National Forest is located in northern New Hampshire (White Mountain Figure 1) and partly into western Maine. Its proclamation boundaries and purchase unit boundaries contain 852,123 acres; 742,163 acres (87%) of this land is managed (FY97) by the White Mountain National Forest. Although national forests may acquire more land within proclamation boundaries and purchase units, RNAs are not likely to be established on inholdings anytime in the near future. Therefore in this assessment we focus on lands managed by the USFS, which we call "national forest land" or "national forest ownership."

To date, three Research Natural Areas (RNAs) are established (2195 acres total, White Mountain Table 1) on the White Mountain National Forest, and there are 8 candidate RNAs (cRNAs).

The White Mountain National Forest occurs almost entirely in Province M212 (New England - Adirondack Province). Overview Appendix IX lists national forests by province. The White Mountain National Forest can work with the Green Mountain National Forest (both in Province M212) to identify which important alliances are unrepresented Province-wide (see Overview Appendix XI), and to establish priorities for the Province.

IX.N.2. METHODS

See Methods of the assessment (page 14) for a detailed description of methods. The following section describes methods specific to the White Mountain National Forest.

IX.N.2.a. Subsections

We identified the subsections occurring on the White Mountain National Forest using the digital subsection map of Keys *et al.* (1995) produced at a scale of 1:3,500,000 and a national digital copy of national forest proclamation boundaries (1972 data provided with ArcInfo). We used the digital maps to determine the amount of land in each subsection within national forest boundaries. We considered ownership acreage within each subsection as 87% of the acreage within proclamation boundaries, based pm the ratio of ownership to proclamation acreas for the entire White Mountain National (FY97). In reality this fraction varies among subsections, but this subsection-specific ownership information was not available. From estimated ownership acreage we calculated the percentage of national forest land (ownership) in each subsection, and the percentage of each subsection with national forest land (ownership).

The percentage of a subsection with national forest land gives an indication of the *prominence* of land coverage by the Forest Service in each subsection, and can be used to prioritize subsections for RNA selection and establishment. In this report, subsections are listed in order of prominence.

The percentage of national forest land in a subsection gives an indication of the *dominance* of a subsection on the national forest, and could also be used in setting priorities for RNA selection and establishment.

IX.N.2.b. Distribution of alliances among subsections

To create the list of alliances for three subsections (M212Ad, M212Ba, and 221Al) of White Mountain National Forest, Mark Anderson of the The Nature Conservancy's Eastern Conservation Science Division provided us with a 1994 alliance-by-subsection list that was developed by The Nature Conservancy and state Natural Heritage Programs. This list was updated to incorporate changes in the classification (Grossman *et al.* 1998). The lists for these subsections still need review from Heritage Program and Forest Service personnel.

Because most (74%) of subsection M212Ad is national forest land, Mark Anderson made the judgement that all alliances identified in this subsection also occur on national forest land. This is also the dominant subsection of the Forest (82% of the Forest is in this subsection). Additional information about alliances on national forest land came from alliance data on White Mountain RNAs. The list for this subsection still needs review from Heritage Program and Forest Service personnel. No data about alliances on national forest land were available for the remaining 2 subsections.

The data for subsections M212Ae, M212Bc, and M212Ag were unavailable.

IX.N.2.c. Identifying RNA-equivalents

Heritage Element Occurrences were used to list potential RNA-equivalents in M212Ad and M212Ae. Only one of these areas met RNA-equivalency criteria. The RNA Committee of the White Mountain National Forest can work with conservation partners to evaluate additional areas and designations for RNA-equivalency in these and the remaining subsections.

IX.N.2.d. Digitizing RNAs

White Mountain National Forest personnel provided digital copies of White Mountain RNA boundaries. They also provided USGS 7.5-minute (1:24,000 scale) topographical maps with outlines of the RNAs. We corrected the Nancy Brook boundary using the Establishment Record and hand-digitized the boundary using a GTCO 3648 SuperL digitizing tablet and ARC/INFO GIS software. Readers can request from the Regional RNA Coordinator a cover of White Mountain RNAs in the projection used by the White Mountain National Forest (Stateplane 4676 feet), or a Region-wide RNA cover at regional projections.

IX.N.2.e. Identifying the presence of natural communities (alliances) on RNAs and RNA-equivalents

All White Mountain National Forest RNA Establishment Records contain information about vegetation in the form of SAF cover types, with total acreage or percentage of area for each type. In some cases we could directly assign an alliance to an SAF type, but most SAF types correspond to more than one alliance. We used vegetation descriptions in the Establishment Records to narrow down our choice. For under-described types, we chose the alliance most likely to occur in that part of the geographic range of the cover type.

All RNA-equivalent data came from Element Occurrence (EO) data (1 EO in subsection M212Ad).

If we were very uncertain about our assignment of an alliance to an occurrence, the occurrence does not represent the alliance. Instead it is listed with a question mark in White Mountain Appendix B. Any reader with knowledge of the site who verifies or corrects an alliance assignment should notify the RNA Coordinator of the White Mountain National Forest; answered questions may result in additional represented alliance-subsection combinations.

The quality/viability ranks are preliminary and need further field verification. If Forest Service personnel re-rank these occurrences or rank new occurrences, the procedure described in Overview Appendix IV should be used. They should not need to use the assumptions above if more information about the site and occurrence is obtained.

IX.N.3. PRELIMINARY RESULTS

This section summarizes what alliance-subsection combinations occur on the White Mountain National Forest and which ones are currently represented by existing RNAs and RNA-equivalents. It also synthesizes RNA needs based on unrepresented ecosystems.

IX.N.3.a. Subsections on national forest land

The 6 subsections which occur on White Mountain National Forest land are:

- White Mountains (M212Ad)
- Mahoosuc Rangely Lakes (M212Ae)
- Sunapee Uplands (M212Bc)
- Vermont Piedmont (M212Ba)
- Western Maine Foothills (M212Ag)
- Sebago-Ossipee Hills and Plains (221Al)

The percentage of a subsection managed by the Forest Service gives an indication of the *prominence* of land coverage by the Forest in the subsection. In this report, subsections are listed in order of prominence (White Mountain Table 4).

The White Mountain National Forest occurs primarily (82%) on Subsection M212Ad (White Mountains Subsection, Table 4). This subsection is also the subsection that contains the most national forest land: 74% of the subsection is White Mountain National Forest land.

Ten percent of White Mountain National Forest land occurs on the Mahoosuc Rangely Lakes Subsection (M212Ae), and 5% of this subsection is White Mountain National Forest land.

The other 4 subsections occupy less than 10% of the National Forest, and less than 5% of these subsections are national forest land. Two of these subsections—221Al and M212Ag—are less than 1% national forest land.

IX.N.3.b. Natural communities in subsections

A total of 68 alliances are reported to occur in the 3 subsections for which we had alliance data. Alliances on national forest land have only been identified on the White Mountains Subsection (M212Ad) with high prominence and dominance. Thirty-six alliances have been identified to occur in this subsection, and all are assumed to occur on national forest land (see Methods and White Mountain Table 5, first column). The 32 alliances not reported to occur on national forest land in Subsection M212Ad are listed in White Mountain Appendix A.

Of the 36 alliances occurring in Subsection M212Ad on the White Mountain National Forest, two are **matrix** alliances (see White Mountain Table 5, first set of alliances), 14 are **large patch** (second set) and 20 are **small patch** (third set). (Explanation of matrix alliance given in "National Vegetation Classification".

The number of alliances on Forest land in a subsection is an indication of the amount of biological variability to be represented in the subsection. The following list would summarize the number of

alliances reported to occur on national forest land in each subsection, but only M212Ad has been developed:

- M212Ad (White Mountains): 36 alliances (2 matrix, 14 large patch, 20 small patch)
- M212Ae (Mahoosuc Rangely Lakes): *no White Mountain National Forest alliance data available*
- M212Bc (Sunapee Uplands): *no White Mountain National Forest alliance data available*
- M212Ba (Vermont Piedmont): *no White Mountain National Forest alliance data available*
- M212Ag (Western Maine Foothills): *no White Mountain National Forest alliance data available*
- 221Al (Sebago-Ossipee Hills and Plains): *no White Mountain National Forest alliance data available*

White Mountain Table 5 lists the 36 alliances that occur in Subsection M212Ad. As these alliances are assumed to occur on national forest land, there are 36 known alliance-subsection combinations (ecosystems to represent). However, the number of alliance-subsection combinations (ecosystems to represent) for the White Mountain National Forest cannot be assessed until data are obtained for the other subsections.

IX. N.3.c. Representation of subsections and natural communities by existing RNAs and RNA-equivalents

Representation of alliance-subsection combinations occurs in both RNAs and one RNA-equivalent.

The number of high-quality (A- or B-ranked) and low-quality (BC- or C-ranked) occurrences of each alliance on all RNAs and RNA-equivalents in each subsection are shown in the appropriate cells of White Mountain Table 5. Only high-quality occurrences provide representation. This information is summarized below for each subsection. D-ranked and unranked occurrences are not addressed; see White Mountain Appendix B for a complete list of alliances occurring on individual RNAs and RNA-equivalents.

RNAs

As of January 1999, there are 3 established RNAs (White Mountain Tables 1, 6) and 8 candidate RNAs (cRNAs) on the White Mountain National Forest. Candidate RNAs are not part of the assessment because they do not yet have Level I protection status.

RNA-equivalents

A discussion of what constitutes RNA-equivalents for the White Mountain National Forest has not taken place. However, based on their suitability as RNA-equivalents elsewhere in the region, the following designations are considered to be RNA-equivalents in this assessment (White Mountain Table 2):

- all State Natural Areas (in both New Hampshire and Maine) and
- all of The Nature Conservancy's (TNC's) preserves[14].

White Mountain National Forest personnel can work with conservation partners to evaluate additional designations possibly meriting RNA-equivalent status (White Mountain Table 3).

From our limited information, we identified only one RNA-equivalent for the White Mountain National Forest. A more thorough search is needed.

[14] Lands currently owned and managed by The Nature Conservancy as a nature preserve.

Subsection M212Ad (White Mountains)

Subsection M212Ad contains 3 RNAs, together covering 2195 acres (White Mountain Table 6, 7a):

- Alpine Gardens (100 acres)
- Nancy Brook (1,385 acres)
- The Bowl (510 acres)

One RNA-equivalent, a TNC preserve, has been identified for the subsection:

- Green Hills Preserve

Additional RNA-equivalents likely exist in this subsection; our ability to find RNA-equivalents was very limited.

Less than 1% of the subsection is protected by the 3 RNAs (White Mountain Table 7a); the size of the one identified RNA-equivalent is unknown.

Natural communities (alliances)

Of 36 alliances reported to be on national forest land in Subsection M212Ad, 8 are represented by a high-quality (A- or B-ranked) occurrence on at least one RNA or RNA-equivalent (White Mountain Table 5, column 212La; White Mountain Table 7b). Additional alliances may be represented if more RNA-equivalents are identified.

Of the 36 alliances, 2 are matrix and 14 are large patch. Both **matrix** alliances are represented and 1 **large patch** alliance is represented. Only 4 of the 20 **small patch** communities are represented.

Subsection M212Ae (Mahoosuc Rangely Lakes)

Subsection M212Ae contains no RNAs. We have no information about alliances on national forest land in this subsection, nor about RNA-equivalents. Thus representation goals and unrepresented alliances are still undefined.

Subsection M212Bc (Sunapee Uplands)

Subsection M212Ae contains no RNAs. We have no information about alliances on national forest land in this subsection, nor about RNA-equivalents. Thus representation goals and unrepresented alliances are still undefined.

Subsection M212Ba (Vermont Piedmont)

Subsection M212Ae contains no RNAs. We have no information about alliances on national forest land in this subsection, nor about RNA-equivalents. Thus representation goals and unrepresented alliances are still undefined.

Subsection M212Ag (Western Maine Foothills)

Subsection M212Ae contains no RNAs. We have no information about alliances on national forest land in this subsection, nor about RNA-equivalents. Thus representation goals and unrepresented alliances are still undefined.

Subsection 221Al (Sebago-Ossipee Hills and Plains)

Subsection M212Ae contains no RNAs. We have no information about alliances on national forest land in this subsection, nor about RNA-equivalents. Thus representation goals and unrepresented alliances are still undefined.

IX. N.3.d. Synthesis: Needs for ecosystem representation

The following table summarizes the needs for representation, and shows a suggested priority ranking of the subsections based on prominence and representation of biological variation (% alliances represented). **These findings are preliminary, as not all aspects of the assessment could be conducted.** The percentage of national forest land and percentage of acres represented in each subsection was not used to prioritize the subsections, though the RNA Committee may choose to do so. The reasoning behind the priority scheme in this table is described below.

The *complete* list of needs is shown in White Mountain Table 5 by shaded cells that contain no number. Once the ecosystems to represent for the White Mountain have been identified, it would be useful to list those alliance-subsection combinations that are not represented in any subsection (unrepresented Forest-wide) to consider giving them high priority.

Subsection	Dominance Percentage of NF land in subsection	Percentage of subsection land area represented	Prominence Percentage of subsection on NF lands	Percentage of alliances represented	Proposed priority
M212Ad (White Mountains)	82	<1?	74	22	high
M212Ae (Mahoosuc Rangely Lakes)	10	*unknown*	5	*unknown*	medium
M212Bc (Sunapee Uplands)	4	*unknown*	3	*unknown*	low
M212Ba (Vernont Piedmont)	2	*unknown*	1	*unknown*	low
M212Ag (Western Maine Foothills)	0.7	*unknown*	0.7	*unknown*	low
221Al (Sebago-Ossipee Hills & Plains)	1	*unknown*	0.5	*unknown*	low

The proposed priority for the White Mountain National Forest subsections is the same as that of descending prominence of the subsections. Once information about representation of alliances is known for the five subsections, then the National Forest could prioritize subsections based on representation of biological variation (alliances).

The White Mountains Subsection (M212Ad) is a high priority to represent, because the majority of the White Mountain National Forest is in this subsection (82%), and the prominence of the White Mountain National Forest in this subsection is very high (74%). Based on our incomplete information, the majority of alliances are still unrepresented in this subsection. The Mahoosuc Rangely Lakes subsection (M212Ae) is of medium priority, because 10% of the Forest is found in this subsection.

The remaining 4 subsections are low priority because the Forest Service occupies only very small portions (<5%) of these subsections, and they occupy only a small portion (<4%) of the National Forest. These subsections should be evaluated for special land types or other ecological features before deciding if little or no representation should occur.

Unrepresented alliances either have not been identified on any RNA or RNA-equivalent in the subsection, or occur on an RNA or RNA-equivalent but are of insufficient quality/viability to be considered represented. Many unrepresented ecosystems are probably simply due to lack of information.

Subsection M212Ad (White Mountains)

Of 36 alliances, 8 are represented by a high-quality occurrence on an RNA or RNA-equivalent (White Mountain Table 7b). Because only a small percentage of the subsection is represented and the White Mountain National Forest lands are prominent in this subsection, it is the highest priority to represent.

Both matrix alliances identified in the subsection are represented. Only 1 of 14 large patch alliances is represented, and 5 of 20 small patch alliances are represented.

The highest priority for this subsection may be to do a more complete evaluation of possible RNA-equivalents and determine which alliances they represent.

Remaining Subsections

Little information is available for the remaining subsections:

- M212Ae (Mahoosuc Rangely Lakes)
- M212Bc (Sunapee Uplands)
- M212Ba (Vernont Piedmont)
- M212Ag (Western Maine Foothills)
- 221Al (Sebago-Ossipee Hills and Plains)

Thus we cannot suggest priorities for unrepresented alliance-subsection combinations (ecosystem to represent).

One important step is to:

- Complete the identification of ecosystems to represent by assessing which alliances occur on national forest land in subsections M212Ae, M212Bc, M212Ba, M212Ag, and 221Al.

Another important step is to better document what ecosystems are currently represented by:

- Identify RNA-equivalents and the alliances that occur in them. Rank the quality/viability of these alliances to see if they represent the ecosystems.
- Evaluate low-quality (BC- or C-ranked) occurrences, which cannot represent ecosystems, to determine if they are indeed low-quality. If a quality/viability rank is raised to B or higher, then the occurrence will represent the alliance in the subsection. (See "Criteria for representation" and Overview Appendix VIII for the ranking procedure and the assumptions we used.)
- Evaluate candidate RNAs for unrepresented alliance-subsection combinations and complete the establishment process of any candidate RNAs that represents unrepresented ecosystems.

WHITE MOUNTAIN TABLES

White Mountain Table 1. Established research natural areas (RNAs) of the White Mountain National Forest

RNA	Acres	Subsection	Established
Alpine Gardens	300	M212Ad	1989
The Bowl	510	M212Ad	1931
Nancy Brook	1,385	M212Ad	1991

White Mountain Table 2. Designations identified to date as RNA-equivalents for the White Mountain National Forest

Protected area designation	Managed by
Preserves of The Nature Conservancy (TNC)	The Nature Conservancy (private)
State natural areas	New Hampshire Dept. of Resources & Economic Development, Maine Natural Areas Program

White Mountain Table 3. Protected area designations not fully evaluated for RNA-equivalency for the White Mountain National Forest

The White Mountain National Forest can work with these organizations to consider RNA-equivalency (see Methods).

Protected area designation	Managed by
Special Areas, including Wilderness	USDA Forest Service
National Park Service Units	National Park Service
Private Nature Preserves (*e.g.*, Lost River Reservation)	Private agencies other than The Nature Conservancy
University preserves	Universities
Local Ecological Areas (*e.g.*, Great Hill Pond)	Local

White Mountain Table 4. Subsections of the White Mountain National Forest (NF), in order of prominence

"NF acres" is the acres of national forest land (ownership) in the subsection. "Prominence" is NF acres/Total subsection acres; these percentages do not add to 100. "Dominance" is NF acres divided by White Mountain total ownership, and these percentages do add to 100, within rounding error. All values are approximate. See also "Identifying subsections and natural communities on national forest land", "Subsections and natural communities on national forest land", and White Mountain Figure 3.

Subsection	Total subsection acres	NF acres	Prominence Percentage of subsection on NF lands	Dominance Percentage of NF land subsection
M212Ad—White Mountains	858,386	631,694	74	82
M212Ae—Mahoosuc Rangely Lakes	1,682,813	76,467	5	10
M212Bc—Sunapee Uplands	1,038,601	32,706	3	4
M212Ba—Vermont Piedmont	1,833,920	18,250	1	2
M212Ag—Western Maine Foothills	805,866	5,879	0.7	0.7
221Al—Sebago-Ossipee Hills & Plains	1,767,212	9,090	0.5	1
White Mountain total ownership:		774,086		

White Mountain Table 5 [preliminary]. Subsections and alliances reported on White Mountain National Forest (NF) land and their representation by RNAs and RNA-equivalents.

Alliances are listed by their community pattern (matrix, large patch, small patch), and subsections are sorted by NF prominence (White Mountain Table 4, fourth column). The presence of an alliance in a subsection and on NF land in the subsection is indicated by dots and shading, respectively. The number of high-quality and low-quality occurrences of an alliance on RNAs and RNA-equivalents in a subsection are shown in each cell. AB = high-quality = quality/ viability rank of A or B; C = low-quality = rank of BC or C. "AB" occurrences are of sufficient quality to represent the alliance in the subsection; "C" ocurrences are not. (See V.D. Criteria for representation.) WM= White Mountains, MRL= Mahoosuc Rangely Lakes, SU= Sunapee Uplands, VP= Vermont Piedmont, SO= Sebago-Ossipee Hills and Plains, WMF= Western Maine Foothills. For a list of alliances occurring in subsections of the White Mountain NF but not reported on NF land, see White Mountain Appendix A. For alliance nomenclature, see Overview Appendix IV. This table is preliminary because NF alliance data and representation data were only available for subsection M212Ad. However, M212Ad is 82% of the NF.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Subsections of White Mountain NF

Community Pattern **Alliances Reported on NF Land**	M212Ad (WM)		M212Ae* (MRL)		M212Bc* (SU)		M212Ba §		221AI§ (SO)		M212Ag* (WMF)	
Matrix Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Red Spruce - Balsam Fir Forest Alliance	2	▪					▪		▪			
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	1	▪					▪		▪			
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
Eastern Hemlock - Yellow Birch Forest Alliance	▪						▪		▪			
Eastern White Pine - Eastern Hemlock Forest Alliance	▪								▪			
Northern White Cedar Forest Alliance	▪											
White Pine - (White Oak, Red Oak, Black Oak) Forest Alliance	▪								▪			
Sugar Maple - White Ash - American Basswood Forest Alliance	▪						▪		▪			
Eastern Cottonwood Temporarily Flooded Forest Alliance	▪						▪		▪			
Red Maple Seasonally Flooded Woodland Alliance	▪						▫		▪			
Black Spruce Saturated Forest Alliance	▪								▪			
Northern White Cedar - Red Maple Saturated Forest Alliance	▪								▫			
Northern White Cedar Saturated Forest Alliance	▪						▪		▪			
Red spruce - Balsam Fir Saturated Forest Alliance	▪						▪		▪			

* No community data are available at this time.

§ No information about alliances on national forest land is available at this time.

Community Pattern **Alliances Reported on NF Land**	**Subsections of White Mountain NF**					
	M212Ad (WM)	**M212Ae* (MRL)**	**M212Bc* (SU)**	**M212Ba §**	**221Al§ (SO)**	**M212Ag* (WMF)**
Red Spruce - Red Maple Saturated Forest Alliance	▪			▫	▪	
Black Spruce Saturated Woodland Alliance	▪			▪	▪	
Black Spruce - Balsam Fir Shrubland Alliance	1 ▪					
Small Patch Alliances **Rank:**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**	**AB C**
Paper Birch Forest Alliance	1 ▪					
Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance	▪			▪	▪	
Black Spruce - Tamarack Saturated Forest Alliance	1 ▪					
Eastern Hemlock Saturated Forest Alliance	▪				▪	
Red Maple - Black Gum Saturated Forest Alliance	▪				▪	
(Jack Pine, Red Pine) Woodland Alliance	(1) ▪			▪	▪	
Northern White-cedar Woodland Alliance	▪			▪	▫	
Red Spruce Woodland Alliance	▪				▪	
American Basswood - White Ash Woodland Alliance	▪			▪	▪	
Red Oak - Rock Chestnut Oak Woodland Alliance	▪			▪	▪	
Leatherleaf / Wiregrass Sedge Saturated Shrub Herbaceous Alliance	▪			▪	▪	
(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) Dwarf-shrubland Alliance	▪			▪	▪	
Alpine Blueberry Dwarf-Shrubland Alliance	1 ▪			▪	▪	
Black Crowberry Dwarf-shrubland Alliance	▪					
Sheep-Laurel - Labrador Tea Dwarf-shrubland Alliance	▪			▫		
American Cranberry Saturated Dwarf-Shrubland Alliance	▪			▪	▪	
Huckleberry (Black, Dwarf) Saturated Dwarf-Shrubland Alliance	▪			▪	▪	
Leatherleaf Saturated Dwarf-Shrubland Alliance	▪			▪	▪	
Bigelow's Sedge - Three-forked Rush Herbaceous Alliance	1 ▪					
Tufted Bulrush Herbaceous Alliance	▪					

* No community data are available at this time.

§ No information about alliances on national forest land is available at this time.

White Mountain Table 6. RNAs and RNA-equivalents of the White Mountain National Forest
Size, in acres, of each RNA or RNA-equivalent is listed after its name. RNA-equivalents are national forest lands or non-Forest lands that have similar protection and management to that of an RNA.

Subsection	RNA (acres)	RNA-equivalent (TNC Preserve)
M212Ad	Alpine Gardens RNA (100) Nancy Brook RNA (1,385) The Bowl RNA (510)	Green Hills Preserve
M212Ae		
M212Bc		
M212Ba		
M212Ag		
221Al		

White Mountain Table 7. Summary of subsection representation on the White Mountain National Forest

7a. Number of RNAs and RNA-equivalents (RNA-eq) and number of acres they protect
The percent total land area representation is the percentage of total subsection area protected by RNAs and RNA-equivalents. RNA-equivalents occur on or off national forest land. *? = unknown*

Subsection	Number of		Land area representation		
	RNAs	RNA-eq	RNA	RNA-eq	Total
M212Ad. White Mountains	3	*1(+)*	5,913	*?*	*?*
M212Ae. Mahoosuc Rangely Lakes		*?*			*?*
M212Bc. Sunapee Uplands		*?*			*?*
M212Ba. Vermont Piedmont		*?*			*?*
M212Ag. Western Maine Foothills		*?*			*?*
221Al. Sebago-Ossipee Hills & Plains		*?*			*?*
TOTAL	3	*?*	5,913	*?*	*?*

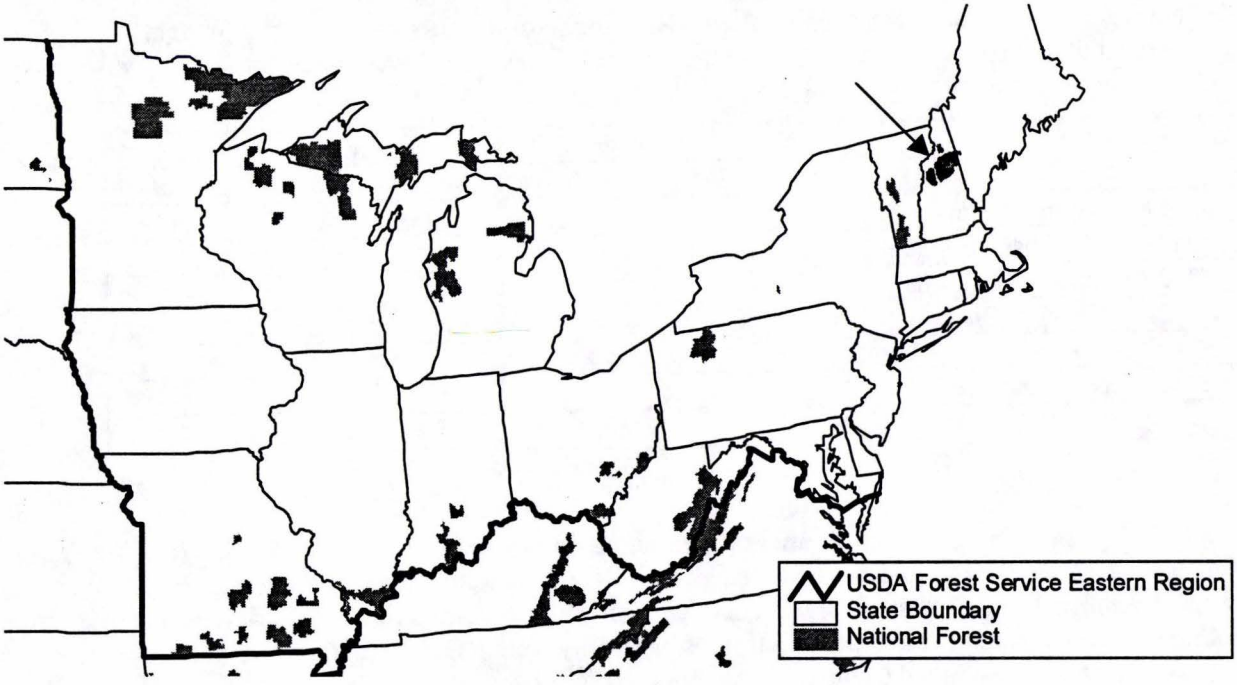
7b. Number and percentage of alliances represented on RNAs and RNA-equivalents (RNA-eq)
Representation requires a protected occurrence of an alliance in a subsection with an A or B quality/viability rank (high-quality). Alliances with only BC- or C-ranked (low-quality) occurrences are not represented but are counted for the purposes of priority-setting (see "Criteria for Representation"). Alliances with only D-ranked occurrences are not counted. *? = unknown*

Subsection	# Alliances on NF land	Alliance representation			Low-quality*
		RNA	RNA-eq	Total**	
M212Ad. White Mountains	36	7 *19%*	*1(+)* *3%+*	*8(+)* *22%+*	
M212Ae. Mahoosuc Rangely Lakes	*?*		*?*	*?*	
M212Bc. Sunapee Uplands	*?*		*?*	*?*	
M212Ba. Vermont Piedmont	*?*		*?*	*?*	
M212Ag. Western Maine Foothills	*?*		*?*	*?*	
221Al. Sebago-Ossipee Hills & Plains	*?*		*?*	*?*	

* Unrepresented alliances with a lower quality (BC- or C-ranked) occurrence on at least 1 RNA or RNA-equivalent.
**Total counts may be less than the sum of RNA and RNA-equivalent counts, since the same alliance can occur in both an RNA and RNA-equivalent

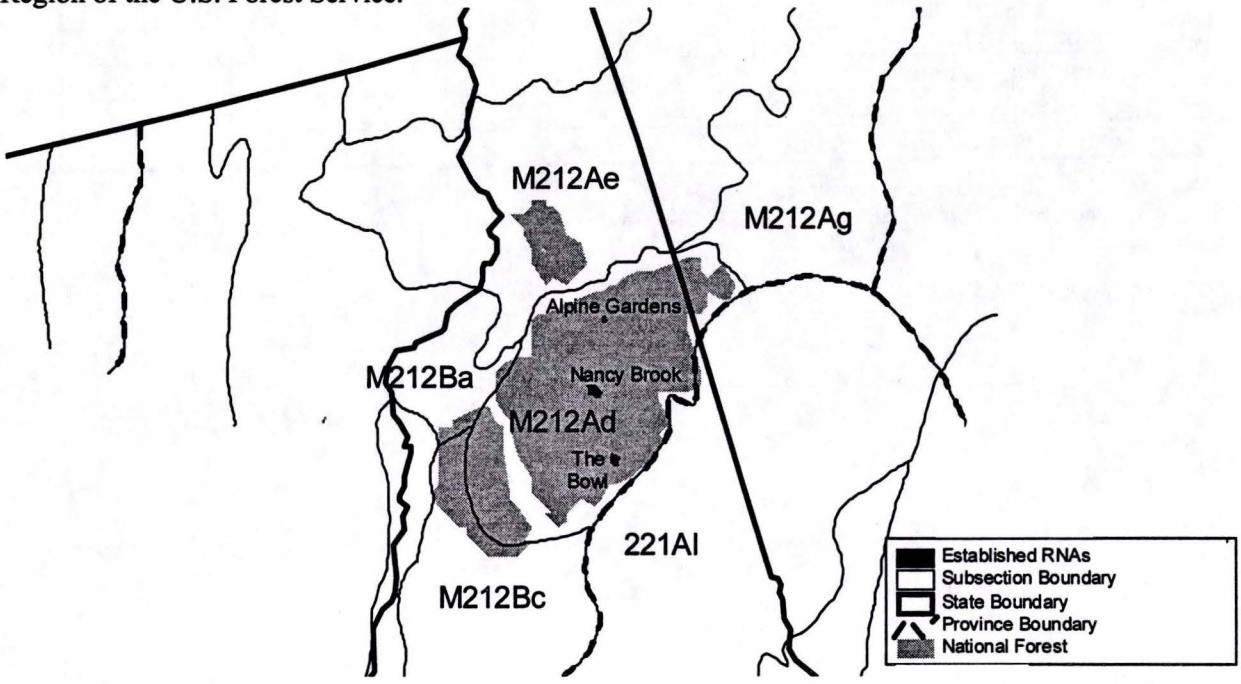
WHITE MOUNTAIN FIGURES

White Mountain Figure 1. Location of the White Mountain National Forest.

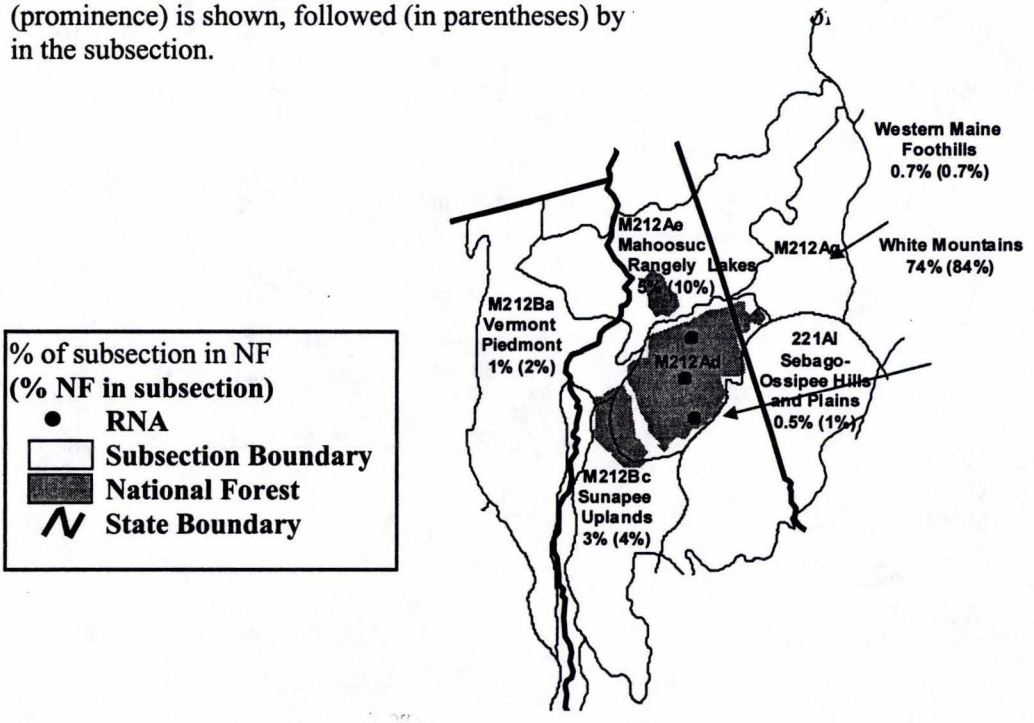


White Mountain Figure 2. The White Mountain National Forest with established RNAs and subsections

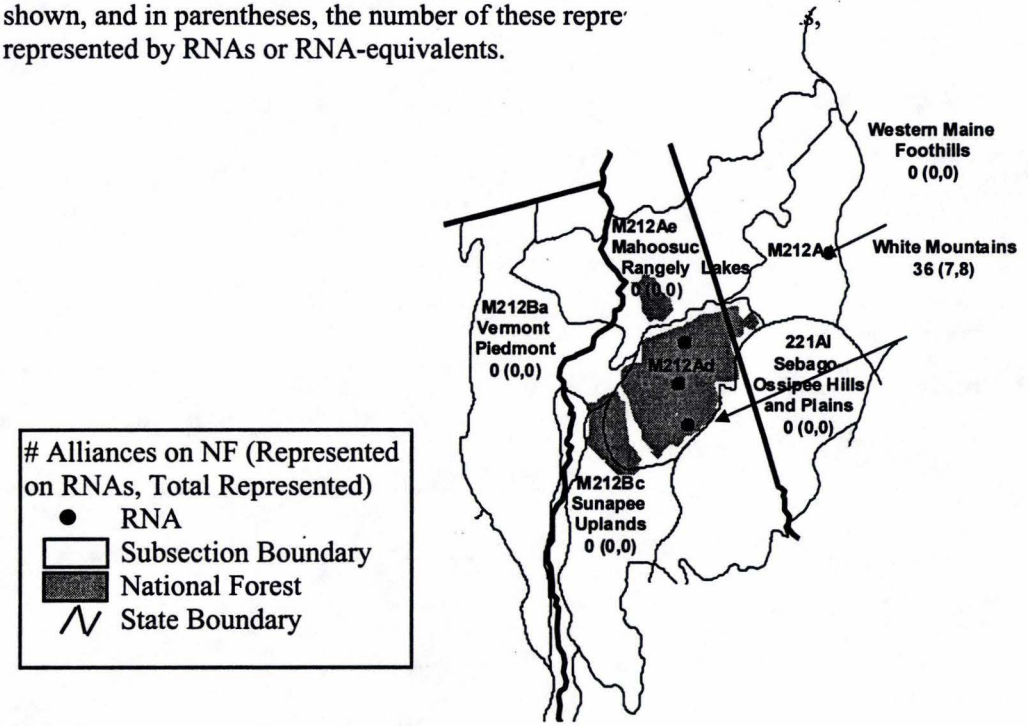
A digital copy of the RNA boundaries is available by contacting the RNA Coordinator of the Eastern Region of the U.S. Forest Service.



White Mountain Figure 3. White Mountain National Forest in relation to subsections.
National forests are shaded, but not all land in the shaded are is managed by the national forests. In each subsection the percentage of the subsection managed by the White Mountain National Forest (prominence) is shown, followed (in parentheses) by
in the subsection.



White Mountain Figure 4. Alliance representation on subsections of the White Mountain National Forest.
The entire White Mountain National Forest is shaded, but not all land in the shaded area is managed by the National Forest. In each subsection, the number of alliances occurring on national forest land is shown, and in parentheses, the number of these repre
represented by RNAs or RNA-equivalents.



WHITE MOUNTAIN APPENDICES

White Mountain Appendix A. Subsections of the White Mountain National Forest and alliances reported to occur in these subsections but not reported to occur on national forest land.

See White Mountain Table 5 for information on the format of this table. The difference between these two tables is that White Mountain Table 5 lists alliances reported on national forest land, and this appendix lists alliances NOT reported on national forest land. The purpose of this appendix is to aid in review of White Mountain Table 5, i.e., to verify that these alliances do not occur on national forest land.

Legend (by alliance)

Forest distribution	Subsection distribution	# of occurrences of rank: AB	C	
Reported on NF land	• Reported in subsection	2	1	RNA
Possibly on NF land	▫ Possibly in subsection	(3)	(2)	RNA-equivalent

Community Pattern **Alliances not Reported on NF Land**	**Subsections of White Mountain NF**											
	M212Ad (WM)		M212Ae *		M212Bc *		M212Ba (VP)		221Al (SO)		M212Ag* (WMF)	
Large Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Pignut Hickory, Shagbark Hickory) - White Ash - Oak (White, Red) Forest Alliance									•			
Red Oak - Sugar Maple - (White Oak) Forest Alliance		▫						•	•			
Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance								•	▫			
Red Maple - Green Ash Seasonally Flooded Forest Alliance		▫							•			
Black Ash - Red Maple Saturated Forest Alliance		▫						•	▫			
Pitch Pine Woodland Alliance									•			
Small Patch Alliances **Rank:**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**	**AB**	**C**
(Pitch Pine, Shortleaf Pine) - Scarlet Oak Forest Alliance									•			
White Pine Forest Alliance									•			
Black Oak - White Oak Forest Alliance								•	▫			
Atlantic White-Cedar - Red Maple Saturated Forest Alliance									•			
Atlantic White-cedar Saturated Forest Alliance									•			
Pitch Pine Saturated Woodland Alliance									•			
Pitch Pine - Oak (Scarlet, Black) Woodland Alliance									•			
Black Willow Temporarily Flooded Shrubland Alliance								•	•			
Buttonbush Semipermanently Flooded Shrubland Alliance		▫						▫	•			
Smooth Alder Temporarily Flooded Shrubland Alliance		▫						▫	▫			
Highbush Blueberry Saturated Shrubland Alliance		▫						•	•			
Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance									•			

Community Pattern **Alliances not Reported on NF Land**	**Subsections of White Mountain NF**					
	M212Ad (WM)	**M212Ae ***	**M212Bc ***	**M212Ba (VP)**	**221Al (SO)**	**M212Ag* (WMF)**
Beakrush - Meadow-Beauty Seasonally Flooded Herbaceous Alliance					▪	
Canada Bluejoint Seasonally Flooded Herbaceous Alliance	▫			▫	▫	
Tussock Sedge Seasonally Flooded Herbaceous Alliance	▫			▫	▫	
Twig Rush Seasonally Flooded Herbaceous Alliance					▪	
Cattail (Narrowleaf, Common) - (Bulrush) Semipermanently Flooded Herbaceous Alliance	▫			▫	▫	
Eurasian Softstem Bulrush Semipermanently Flooded Herbaceous Alliance	▫			▫	▫	
False Asphodel - American Grass of Parnassus Saturated Herbaceous Alliance				▪		
Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance	▫			▫	▫	
Broadleaf Pondlily Permanently Flooded Temperate Herbaceous Alliance	▫			▫	▫	
White Water Lily - Robbins' Spike-rush Permanently Flooded Herbaceous Alliance					▪	

* No data are available at this time.

White Mountain Appendix B. Alliance occurrences on RNAs and RNA-equivalents in subsections of the White Mountain National Forest.

For each subsection, all alliances reported on an RNA or an RNA-equivalent are listed, together with their acreages and quality/viability ranks. The 3 sub-ranks--(S)ize, (C)ondition, and (L)andscape--which make up the overall quality rank are shown in a smaller font. Ranks range from A (excellent viability) to D (probably not viable); "I" = inclusion, "M" = modified vegetation type (not a target), "U" = unknown, and "H" = historic, meaning that the occurrence probably no longer exists (see Overview Appendix IV). If the identity of an alliance based on a vegetation description is highly uncertain, a question mark appears in the last column (?). The rank of these alliances begins with a "Q"; if the taxonomic question is resolved, the Q may be removed.

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
Subsection* M212Ad. *White Mountains								
Matrix Alliances								
Red Spruce - Balsam Fir Forest Alliance	Nancy Brook		1,370	B	A	B	AB	
	The Bowl		398	B	A	B	B	
Sugar Maple - Yellow Birch - (American Beech) Forest Alliance	The Bowl		96	CD	A	B	B	
Large Patch Alliances								
Black Spruce - Balsam Fir Shrubland Alliance	Alpine Gardens		96	B	A	B	AB	
Small Patch Alliances								
Paper Birch Forest Alliance	The Bowl		16	C	B	B	B	
Black Spruce - Tamarack Saturated Forest Alliance	Nancy Brook		15	C	B	B	B	
(Jack Pine, Red Pine) Woodland Alliance		Green Hills Preserve		B?	A	B	B	
Alpine Blueberry Dwarf-Shrubland Alliance	Alpine Gardens		2	C	A	B	B	
Bigelow's Sedge - Three-forked Rush Herbaceous Alliance	Alpine Gardens		2	C	A	B	B	
		White Mountains (M212Ad) Total:	1,995					
Subsection* M212Ae. *Mahoosuc Rangely Lakes								
		Mahoosuc Rangely Lakes (M212Ae) Total:						
Subsection* M212Bc. *Sunapee Uplands								
		Sunapee Uplands (M212Bc) Total:						
Subsection* M212Ba. *Vermont Piedmont								
		Vermont Piedmont (M212Ba) Total:						
Subsection* M212Ag. *Western Maine Foothills								
		Western Maine Foothills (M212Ag) Total:						
Subsection* 221Al. *Sebago-Ossipee Hills and Plains								
		Sebago-Ossipee Hills and Plains (221Al) Total:						

Community Pattern Alliance	RNA	RNA-equivalent	Acres	S	C	L	Rank	?
		Grand Total:	1,995					

? A question mark indicates that the vegetation description given for the RNA or RNA-equivalent was inadequate to identify the alliance with confidence.
* Rank assignment is uncertain.

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XI. OVERVIEW TABLES

Overview Table I. The Forest Service National Hierarchical Framework of Ecological Units (from McNab and Avers 1994)

Ecological Unit	Planning and Analysis Scale	General Size Range
Domain	Global ⎫	sq. miles: 10,000s - 1,000,000s
Division	Continental ⎬ (Ecoregion)	
Province	Regional ⎭	
Section	Subregion	sq. miles: 10s - 1,000s
Subsection		
Landtype Association	Landscape	acres: 100s - 1,000s
Landtype	Land unit	acres: <10 - 100s
Landtype Phase		

Overview Table II. The Nature Conservancy's physiognomic-floristic hierarchy for terrestrial vegetation (natural communities) (from Grossman *et al.* 1998)

Level	Basis for Classification	Example
System	Terrestrial vs. Aquatic vs. Subterranean	Terrestrial
Class	Growth form and structure of vegetation	Woodland
Subclass	Leaf phenology	Deciduous Woodland
Group	Leaf types, corresponding to climate	Cold-Deciduous Woodland
Subgroup	Relative human impact (natural, cultural)	Natural
Formation	Additional physiognomic and environmental factors, including hydrology	Temporarily Flooded Cold-Deciduous Woodland
Alliance	Species of uppermost or dominant stratum	Cottonwood Temporarily Flooded Woodland Alliance
Association	Additional species of any strata	Eastern Cottonwood - (Peach-leaf Willow) / Narrow-leaved Willow Woodland

Overview Table III. Community pattern

Pattern	Cover of an Occurrence	Average Size of an Occurrence (acres)	Extent of an Occurrence	Historic Landcover in an Ecoregion
Matrix	extensive, often contiguous	1,000 - 1,000,000	extensive	75-80%
Large Patch	large, interrupted	50 - 1,000	less extensive or less common	≥ 20%
Small Patch	small, discrete	1 - 50	specialized or microhabitat	≥ 5%

Overview Table IV. Overall* quality/viability rank for occurrences of natural communities in subsections

Quality/Viability Rank*	Description	Predicted Viability	Represents the ecosystem?
A	excellent quality	high	Yes
B	good quality	moderate	Yes
C	fair quality	low	No, but lower priority to represent
D	poor quality	not viable	No

*This rank combines individual ranks for condition, size, and landscape.

Overview Table V. Examples of alliances by community pattern and distribution for the Lake States portion of Province 212

	MATRIX	LARGE PATCH	SMALL PATCH
ENDEMIC	Red Pine Forest	Jack Pine-(Northern Pin Oak, Black Oak) Forest	Cobble-Gravel Shore Sparse Vegetation
LIMITED	White Pine Forest	Northern White Cedar Forest	Wild Rice Semipermanently Flooded Herbaceous Vegetation
WIDESPREAD	Sugar Maple-Yellow Birch-(American Beech) Forest	Black Ash-Red Maple Saturated Forest	Bog Birch-(Willow Spp.) Saturated Shrubland
PERIPHERAL		Silver Maple Temporarily Flooded Forest	Non-tidal mud flats

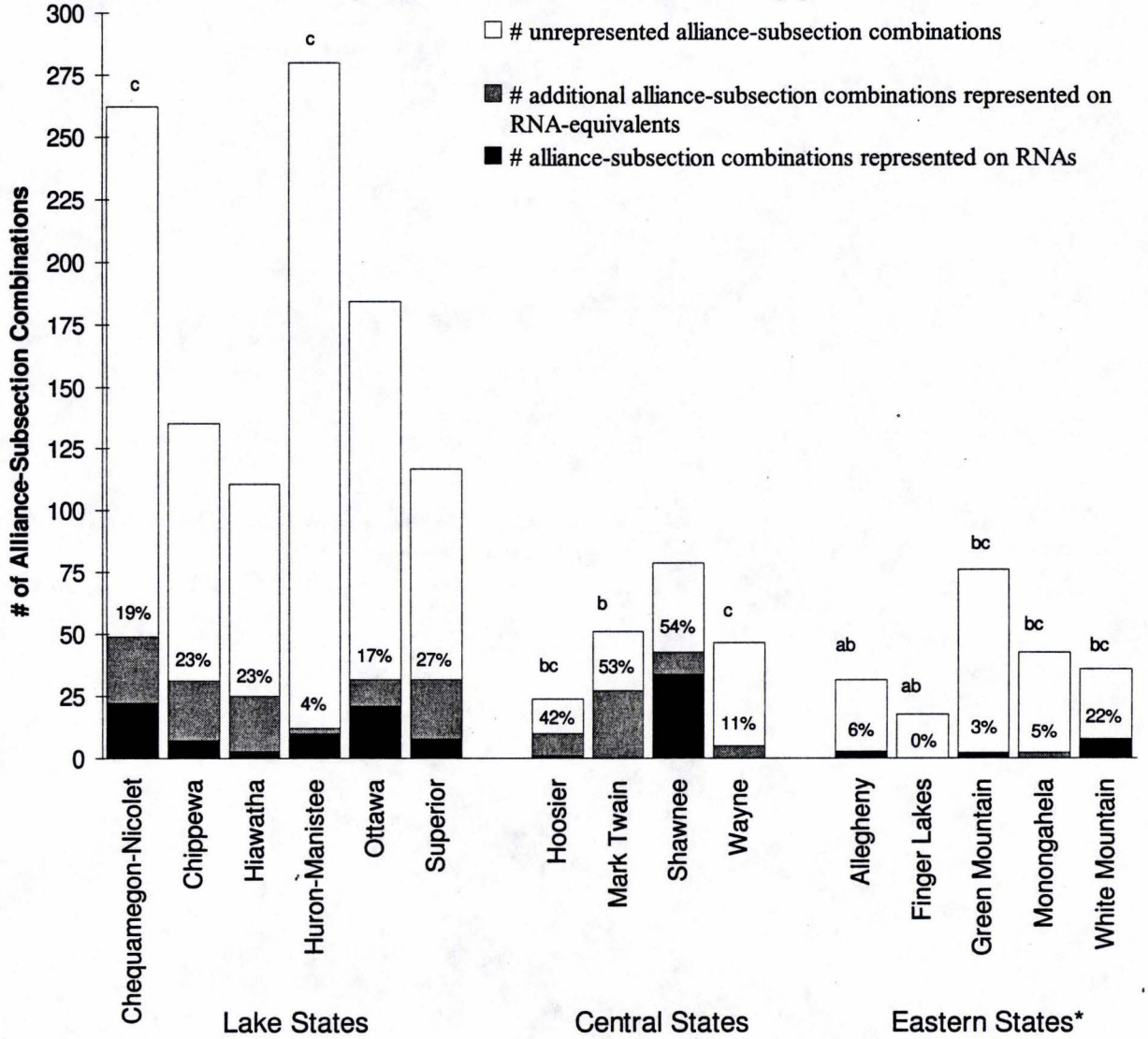
Overview Table VI. RNA selection criteria

CRITERION	PREFERRED	ACCEPTABLE if preferred not available
General Selection Criteria		
1. TNC / Heritage Quality/Viability ranking	High (A, B)	Low (BC or C)
2. Evidence of recent human disruption	Little or none	More disturbance
3. Post-disruption resilience	High	Low
4. Size of area	Larger	Smaller
5. Exotics or risk of invasion by exotics	Low	Moderate
6. Ability to maintain or restore natural processes	Good	Limited
Forested Communities		
1. Stand age	Older	Less old
2. Evidence of cutting, thinning, grazing	None	Limited
3. Average or maximum diameter at breast height	Larger	Not as large
4. Forest interior	Present	Reduced
Riverine Communities		
1. Development/disruption along river corridor	None	Minor
2. Land status along shoreline	Forest Service-managed	Majority Forest Service-managed
3. Riparian vegetation and woody debris	Intact	Disrupted or modified
Lacustrine Communities		
1. Development /disruption along lakeshore	None	Minor
2. Land status along lakeshore	Forest Service-managed	Majority USFS
3. Lakeshore vegetation and woody debris	Intact	Disrupted or modified
4. Fisheries	Native	Stocking minimal
Spatial Planning Criteria		
1. Ecosystem in relation to other ecosystems	Landscape of several ecosystems	Single ecosystem with buffer
2. Proximity to other natural areas	Adjacent, Proximate	Isolated
3. Connectivity to other natural areas	Corridor present	Corridor lacking
4. Landscape context—adjacent lands	Management for natural processes	Intensive management
5. Shape of area	Non-linear (protects interior)	Linear (less interior)
6. Fragmentation of area	Unfragmented	Some fragmentation
Administrative Criteria		
1. Land management	Forest Service	--
2. Administrative control	Reasonable	--
3. Boundaries	Certifiable	Survey needed
4. Roads	None or could be closed	Minor impact on RNA
5. Recreational conflicts	Low or absent	--
6. Surrounding land use and management	No impact on RNA	Low impact on RNA
7. Subsurface mineral ownership	Forest Service	Not owned, but low risk of development
8. Timber base	Unsuited	Suited
9. Wilderness boundaries	Within Wilderness	Outside Wilderness

XII. OVERVIEW FIGURES

Overview Figure I. Number of alliance-subsection combinations represented by national forests in the Eastern Region. The black shading shows the number of alliance-subsection combinations represented by established RNAs. The gray shading shows the number of *additional* alliance-subsections that are represented when RNA-equivalents are included in the network of representative areas; it does not include alliances represented by RNA-equivalents that are also represented by RNAs. The open portions of each bar shows the number of unrepresented ecosystems (needs) for each national forest, based on available information. The total height of each bar is the total number of alliance-subsection combinations for the national forest, and the number inside the bar is the percentage of these combinations that are represented within an RNAs or RNA-equivalent.

Some of the data are incomplete, as indicated by the symbols on top of the bars. See the "Eastern Region RNA Assessment results summary" section for more discussion of data gaps.



* The Eastern States National Forest assessments are preliminary.

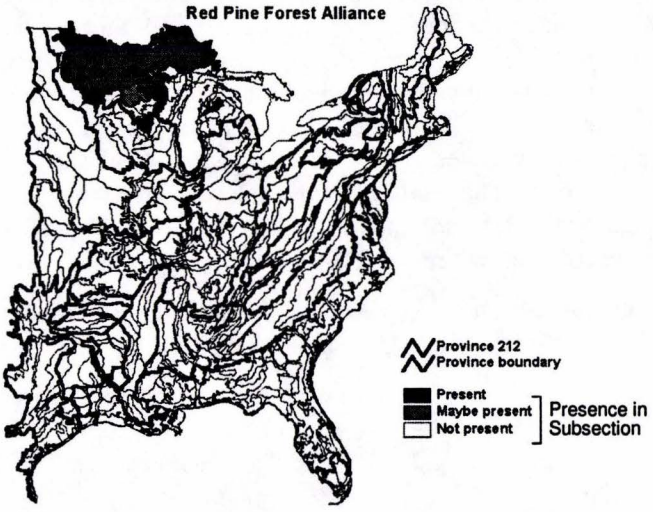
[a] RNA-equivalents have not been identified.

[b] Total number of alliance-subsection combinations is incomplete and likely to rise with more information.

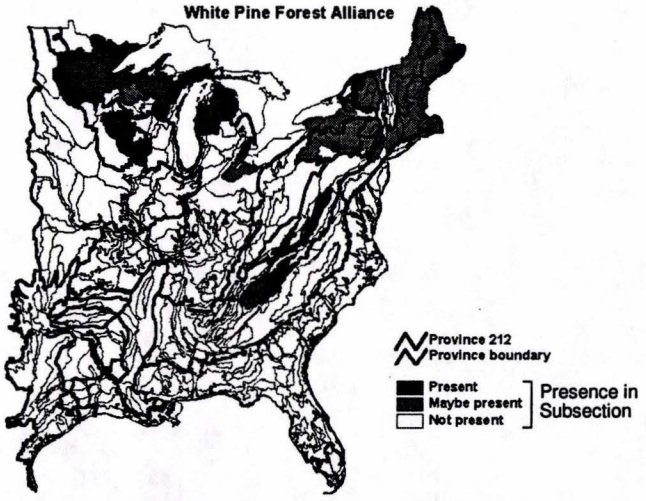
[c] RNA-equivalent data are incomplete.

Overview Figure II. Examples of community distribution. Alliances that are (a) endemic, (b) limited, and (c) widespread with respect to Province 212. Data are from 1996 and may be somewhat incomplete.

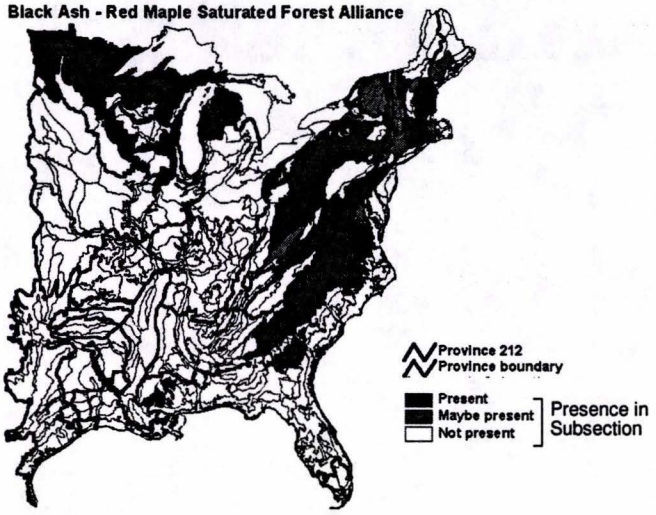
a) Endemic



b) Limited



c) Widespread



XIII. GLOSSARY

In this assessment we have given specific meanings to several general terms. These terms, plus some terms more broadly used by the conservation community, the USDA Forest Service, and The Nature Conservancy, are included here. *Note: Cross-references are indicated in* SMALL CAPS.

Alliance: A level of the National Vegetation Classification of *existing* (as opposed to potential) vegetation. An alliance is a terrestrial plant community that is distinguished from other alliances by one or more dominant or diagnostic species which are found in the dominant and/or uppermost layers of the vegetation (Faber-Langendoen *et al.* 1996, Sneddon *et al.* 1996, Grossman *et al.* 1998, Drake and Faber-Langendoen 1997). The concept of an alliance is similar to a "cover type." An alliance is equivalent to a "cover type" when the dominant species also have diagnostic value. A cover type includes one or more alliances when the dominant species extend over large geographic areas and varied environmental conditions. An alliance includes one or more ASSOCIATIONS (Table II).

Association: The finest level of the National Vegetation Classification. Associations are closely related to the community types used by most state Heritage programs. Associations are grouped into ALLIANCES (Table II). For example, the Jack Pine/Balsam Fir Forest association, Jack Pine/(Red Oak-Northern Pin Oak) Forest association, and the Jack Pine/Blueberry/Feathermoss Forest association are all in the Jack Pine Forest Alliance.

Community Distribution: Describes the geographic distribution of a community (*e.g.*, alliance) in relation to a PROVINCE. The 4 classes of community distribution are based on the distribution of the alliance in and out of the Province. The classes are ENDEMIC, LIMITED, WIDESPREAD, and PERIPHERAL (Figure II). A given alliance can be assigned to different community distribution classes for different Provinces. For example, Red Pine Forest Alliance is endemic to Province 212 and peripheral to Province 222.

Community Pattern: Describes the landscape pattern that is (or was) typical of a community (*e.g.*, alliance) across its entire range. It categorizes the degree to which an community forms (or formed) extensive cover on the landscape (Table III). The classes are MATRIX, LARGE PATCH, and SMALL PATCH.

Conservation Partner: From the perspective of the Forest Service, a conservation partner is an organization that works together with the Forest Service towards a common goal of conservation of biodiversity.

Ecosystems to Represent: Specifically, each ALLIANCE in each SUBSECTION that occurs on national forest land (alliance-subsection combinations). Also called a *cell*, because the ecosystems to represent can be seen as a cell in a matrix (table) of alliances by subsections. Representation can be accomplished with existing RNAs and RNA-equivalents if the alliance occurrences on these areas are of high enough QUALITY/VIABILITY. Collectively, the ecosystems to represent across all national forests comprise the units to be represented in the network of REPRESENTATIVE RNAs for the Eastern Region.

Ecological Unit: A generic term for a mappable land unit under the National Hierarchy of Ecological Units, at any level of the Hierarchy (Table I). For example, see SUBSECTION or PROVINCE. Ecological units are distinguished by both abiotic and biotic characteristics, including climate, geological parent materials, landforms, local topography and aspect, soils, and potential natural vegetation.

Element Occurrence: A Natural Heritage term for an on-the-ground example of a species or a community type that can then be mapped and stored in the Heritage database as an element occurrence record (EOR). There are criteria and procedures that Heritage programs use in order to document an observation of a species or community type as an "element occurrence." An Element Occurrence of a

community type is typically documented at the ASSOCIATION level of community classification. In this document, unless we specify "Element Occurrence", we use the term "occurrence" in a more general sense. See OCCURRENCE.

Endemic: Describes communities (*e.g.*, alliances) that occur primarily or only in the PROVINCE of reference (Figure I (a), see COMMUNITY DISTRIBUTION).

EORank: A rank of A-D assigned to each ELEMENT OCCURRENCE (EO) to rate the *condition* of the EO. The rank is stored in the Element Occurrence database as the field "EORank". The ranking system is currently being revised to include the *size* and *landscape context* of an EO, in addition to condition, for an overall measure of QUALITY/VIABILITY. See Appendix IV.

Existing Vegetation: The plant species, along with their abundances and vertical and horizontal spatial pattern, that occur in an area at a particular point in time, and which are classified with little reference to any future potential or developmental context. Distinct from *potential* vegetation, which describes the vegetation "characteristic" or "suitable" to a site. Aspects of the existing vegetation along with environmental factors are used to predict the mature or climax stage that would develop in the absence of any disturbances.

GIS: Geographic Information Systems. A computerized system for creating maps and analyzing spatial data.

High-quality occurrence: An occurrence with a quality/viability rank of A, B, or AB (Table IV, Appendix IV). Distinguished from LOW-QUALITY.

Large Patch: Describes communities (*e.g.*, alliances) that form (or historically formed) large but not extensive areas of cover. They are (or were) influenced by large-scale processes modified by site-specific features. See COMMUNITY PATTERN.

Limited: Describes communities (*e.g.*, alliances) that are common in the PROVINCE of reference and also occur in several other Provinces (Figure II (b), see COMMUNITY DISTRIBUTION).

Level I protection: A highly protected area "maintained in its natural state with an active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference" (Caicco *et al.* 1995). A level of protection at least as high as that of an RNA.

Low-quality occurrence: An occurrence with a quality/viability rank of BC or C (Table IV, Appendix IV). Distinguished from HIGH-QUALITY. (CD-ranked, D-ranked, and unranked occurrences are not included in the assessment (except in Appendix B of each national forest report) and are *not* considered low-quality occurrences.)

Managed: The phrase "land managed by the national forest" means all land that is the responsibility of the USDA Forest Service (*i.e.*, is "owned" by the Forest Service), regardless of its activities on the land. Land within national forest proclamation boundaries and purchase units is made up of "land managed by the national forest", and inholdings by private owners and other government agencies.

Matrix: Describes communities (*e.g.*, alliances) that form (or historically formed) extensive and often unfragmented cover over the landscape. They are (or were) influenced by large-scale processes (*e.g.*, climate, fire), and are important habitat for wide-ranging or large area-dependent animals. See COMMUNITY PATTERN..

Modified Vegetation Type: A NATURAL COMMUNITY that ecologists believe has no "natural" or "historic" analog, *i.e.*, it is dependent upon modern human activities to exist. An example is Bracken Fern - Kalm's Brome Grass Herbaceous Alliance, which is believed to only exist as a result of an intensive burning regime for management of grouse habitat.

Natural Community: A plant community which, broadly defined, has a strong component of native species. Distinct from *cultural landcover*, which is cultivated vegetation or human-made structures.

Occurrence: An on-the-ground (or mapped) example of a community type. An Alliance Occurrence is an on-the-ground example of a community classified at the alliance level. An "occurrence" or "community occurrence" does not specifying the level of community classification. See also ELEMENT OCCURRENCE.

Peripheral: Describes communities (*e.g.*, alliances) that are rare in the PROVINCE of reference and are more common in other Provinces (see COMMUNITY DISTRIBUTION).

Physiognomy: Structural characteristics of plants, including life-form (*e.g.*, tree, shrub, herb), leaf type (*e.g.*, needle-leaf, broad-leaf), phenology (evergreen or deciduous), plant height, and crown shape.

Presettlement: From about 1810 - 1910 employees of the United States Government conducted systematic General Land Office (GLO) surveys of the Midwest. These surveys include some vegetation data which, in several states, have been used to reconstruct the vegetation of that time period, called "Presettlement Vegetation". In the strictest sense, "presettlement" means the time at which the GLO survey was conducted for a particular area. The term is used more generally to mean the time prior to European modification of vegetation.

Prominence: The relationship, in terms of shared land area, of a national forest to a subsection. The higher the percentage of total subsection area within national forest ownership boundaries, the higher the prominence of the national forest in that subsection. The concept can be used to prioritize RNA selection and establishment, because a national forest with high prominence in a subsection has a large impact on the condition of that subsection.

Protected: Managed to minimize modification by humans; maintained permanently in a natural state. (See LEVEL I PROTECTION.)

Province: A level of The National Hierarchy of Ecological Units (Table I, ECOMAP 1993). A province is a land unit of tens of thousands to millions of square miles, corresponding to broad vegetation regions and similar soil orders. Usually named for geographic location and vegetative type (*e.g.*, Laurentian Mixed Forest). See Bailey (1995) for descriptions of Provinces in the United States.

Quality/Viability: Refers to the current state of a community OCCURRENCE; a relative term indicating to what degree the occurrence contains typical species and processes of the community type, and the probability that it will be in good condition into the future. Integrates the condition, size, and landscape context of an occurrence. Using the proposed Natural Heritage Program ranking system for natural community occurrences (Appendix IV), a "HIGH-QUALITY" occurrence is A- or B-ranked, and a "LOW-QUALITY" occurrence is BC- or C-ranked.

Represent: To serve as a typical example of an ecosystem. Specifically, an alliance in a subsection is *represented* if there is an OCCURRENCE of the alliance in the subsection that can serve as a baseline for comparison to manipulated versions of the same ecosystem type. The occurrence must be on an RNA or RNA-equivalent and be A- or B-ranked (HIGH-QUALITY) to represent the alliance-subsection combination. The occurrence *represents* the ecosystem, that is the alliance-subsection combination.

Representative RNA: An RNA that can serve as a control or reference area for one or more community types in an ecological unit (*e.g.*, a subsection). It REPRESENTS the community types in the subsection. *Representative* is used in the sense of "typical example". Representative RNAs form a network of examples of ecosystems found on Forest Service lands. The directive for RNA representation comes from the Forest Service Manual which states, "Preserve a wide spectrum of pristine representative areas that typify important forest, shrubland, grassland, alpine, aquatic, geological and similar natural situations...." (USDA Forest Service 1994)

RNA: Research Natural Area. Unless specifically noted, we are referring to USDA Forest Service RNAs. "A physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention. However, under unusual circumstances, deliberate manipulation may be utilized to maintain the unique feature that the Research Natural Area was established to protect." (Referenced to Federal Committee on Ecological Reserves 1977 in USDA Forest Service 1994)

RNA Assessment: An analysis of the needs for completing a network of REPRESENTATIVE RNAs.

RNA Establishment: The process of designating an RNA which includes evaluation of the site, environmental analysis, the writing of an Establishment Record, and the official land allocation through a decision by the Regional Forester.

RNA Selection: The process of searching for and evaluating land areas for RNA ESTABLISHMENT.

RNA-equivalent: A Forest Service or non-Forest Service area that can serve as a reference area, *i.e.*, that serves the same purpose as a REPRESENTATIVE RNA. To qualify, an area must be a "LEVEL I" protected area (Caicco et al. 1995), "maintained in its natural state with an active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference." Preserves of The Nature Conservancy and State Natural Areas are examples of RNA-equivalents.

Small Patch: Describes communities (*e.g.*, alliances) that form (or historically formed) small, discrete areas of cover. They are (or were) characterized by localized, small-scale ecological processes that can be quite different from the large-scale processes operating in the overall landscape. The specialized conditions of small patch alliances, however, are often dependent on the maintenance of ecological processes in the surrounding matrix and large patch communities. See COMMUNITY PATTERN.

SNA: State Natural Area. A generic term for an area maintained by a state Department of Natural Resources (or equivalent) for the purposes of preserving natural features. These areas are known by different names in different states, *e.g.*, Scientific and Natural Areas (MN), State Nature Preserves (OH), State Natural Areas (WI).

Subsection: A level of The National Hierarchy of Ecological Units (Table I). A subsection is a major landform: a land unit of 10s to 1,000s of square miles, distinguished from other subsections by surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities (ECOMAP 1993). Brief subsection descriptions and references across the eastern United States can be found in Keys *et al.* (1995). Detailed subsection descriptions for the Lake States can be found in Albert (1995).

Target : A representational goal for a network of RNAs using Society of American Foresters (SAF) cover types, according to the 1986 U.S. Forest Service Eastern Regional Guide.

Terrestrial: Used in the National Vegetation Classification (Grossman *et al.* 1998) to describe vegetated communities, as distinct from unvegetated deepwater (aquatic) habitats and unvegetated subterranean habitats. Includes uplands, wetlands, and the portions of lakes, ponds, rivers, and marine shorelines supporting rooted vegetation.

TNC: The Nature Conservancy. A national non-profit organization that works in the United States and abroad to preserve plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

TNC Preserve: Land officially designated as a preserve by The Nature Conservancy (TNC). A preserve is owned and managed by TNC alone, or occasionally in cooperation with other management agencies.

Widespread: Describes communities (*e.g.*, alliances) that are common in the PROVINCE of reference and in many other Provinces (Figure II (c), see COMMUNITY DISTRIBUTION).

XIV. OVERVIEW APPENDICES

OVERVIEW APPENDIX I. Excerpts from Forest Service Manual 4063

(Part of 4060 Research Facilities and Areas)

FOREST SERVICE MANUAL

WASHINGTON

TITLE 4000 - RESEARCH

EFFECTIVE 5/4/94

4063 - RESEARCH NATURAL AREAS. Research natural areas are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. Research natural areas are for nonmanipulative research, observation, and study. They also may assist in implementing provisions of special acts, such as the Endangered Species Act and the monitoring provisions of the National Forest Management Act.

4063.01 - Authority. The general provisions of the Organic Administration Act of 1897 (16 USC 551) authorize the Secretary of Agriculture to designate research natural areas. Under regulations at 7 CFR 2.42, the Secretary has delegated this authority to the Chief, who, pursuant to 36 CFR 251.23, selects and establishes research natural areas as part of the continuing land and resource management planning process for National Forest System lands (36 CFR 219.25 and FSM 1922).

4063.02 - Objectives. The objectives of establishing research natural areas are to:

1. Preserve a wide spectrum of pristine representative areas that typify important forest, shrubland, grassland, alpine, aquatic, geological, and similar natural situations that have special or unique characteristics of scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.
2. Preserve and maintain genetic diversity.
3. Protect against serious environmental disruptions.
4. Serve as reference areas for the study of succession.
5. Provide onsite and extension educational activities.
6. Serve as baseline areas for measuring long-term ecological changes.
7. Serve as control areas for comparing results from manipulative research.
8. Monitor effects of resource management techniques and practices.

4063.03 - Policy. Research Natural Areas may be used only for research, study, observation, monitoring, and those educational activities that maintain unmodified conditions.

The selection and establishment of research natural areas within the National Forest System primarily emerges from continuing land and resource management planning and associated environmental analyses (FSM 1920 and FSM 1950). Forest plans shall include analysis of, and recommendations for, any proposed research natural areas establishment. Where proposals to establish research natural areas arise outside of the forest planning process, the affected Forest Supervisor shall prepare, as part of an establishment record (FSM 4063), a forest plan amendment in accordance with land management planning regulations (36 CFR 219.10(f); FSM 1922.5) and environmental analysis policy and procedures (FSM 1950 and FSH 1909.15).

Unless catastrophic circumstances significantly alter the conditions for which a research natural area was originally created such that it no longer may serve that function, the designation of a research natural area shall be in perpetuity.

The Forest Service shall cooperate with universities, private and professional organizations, and State and other public agencies to establish and maintain a national network of research natural areas primarily on federally administered lands, as well as on lands under other ownerships.

Funding of all on-the-ground resource protection and management activities on research natural areas within the National Forest System shall come from funds appropriated and allocated for the National Forest System. For obtaining appropriated Forest Pest Management Funds when necessary, see FSM 3400.

4063.04 - Responsibility.

4063.04a - Washington Office.

1. Chief. The Chief reserves the authority to determine what important forest and range types are needed for a national network of research natural areas (36 CFR 251.23), and to maintain quality among Regions and Stations in the establishment and management of research natural areas through oversight and common standards.

2. Deputy Chiefs. The Deputy Chief for Research and the Deputy Chief for National Forest System have the responsibility to review the research natural area program. As part of their review the Deputy Chiefs are responsible for identifying important forest and range types needed for the national network of research natural areas and recommending approval of these types to the Chief with the concurrence of the other Deputy.

3. Staff Directors. The Washington Office Director of Forest Management Research shall maintain a national record of all research natural areas.

4063.04b - Regions and Stations.

1. Regional Foresters and Station Directors.

a. It is the responsibility of Regional Foresters, with concurrence of Station Directors, to approve all new research natural areas and to sign the implementing designation order. This authority may not be redelegated.

b. It is the responsibility of Regional Foresters and Station Directors to establish a Regional research natural area committee to determine needs for research natural areas within each Region and each National Forest and, with assistance from this committee, to prepare an establishment record for each recommended research natural area (FSM 4063.41). In consultation with Forest Supervisors and District Rangers, Station Directors have authority to approve all management plans and to oversee and coordinate approved research on all research natural areas, except for those research natural areas in congressionally designated areas (see FSM 4063.05).

c. The authority to concur in issuance of mineral leases including access to research natural areas on National Forest System lands is reserved to the Regional Forester, in consultation with and with the concurrence of the Station Director.

d. The authority to approve management plans and to oversee and coordinate approved research on research natural areas in congressionally designated areas (FSM 4063.05) rests with Regional Foresters (FSM 2323.04c). In exercising this authority, they shall coordinate plans for research with Station Directors. The Regional Forester, with the concurrence of the appropriate Station Director, shall prepare recommendations to the Chief for any proposed Federal mineral, oil, and gas leases on research natural areas that are acquired land (FSM 2820) and on any oil and gas lease on National Forest System lands created from the public domain.

e. Only the Station Director, after consultation with the Forest Supervisor, can approve plans for temporary gauging stations and instrument shelters (FSM 4063.31).

2. Regional Research Natural Area Committee. The role of this committee is to identify the need for research natural areas on National Forest System lands and to ensure that prospective areas are identified in the forest planning process. Upon approval of a forest plan and obtaining results of subsequent surveys of the area, the committee recommends to the Regional Forester and Station Director establishment of research natural areas and assists in the preparation of establishment records.

4063.04c - Projects and Forests.

1. Research Project Leaders. Research project leaders are responsible for coordinating with Forest Supervisors any planned research activities within, and adjacent to, research natural areas.

2. Forest Supervisors. Forest Supervisors have the responsibility to execute approved management plans for research natural areas and to administer, manage, and protect research natural areas. Forest supervisors must coordinate with the Station Director or Director's representative needed changes in management or protection.

The authority to approve mining plans of operations is reserved to the Forest Supervisor in consultation with, and concurrence of, the Station Director.

3. District Rangers. District Rangers are responsible for direct administration, protection, and, in accordance with approved forest plans and/or project prescriptions, management of established research natural areas.

4063.05 - Definitions.

1. Research Natural Area. "A physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention. However, under unusual circumstances, deliberate manipulation may be utilized to maintain the unique feature that the Research Natural Area was established to protect." (Federal Committee on Ecological Reserves 1977. See FSM 4063.43 Suggested References, item 1.)

2. Biological Diversity. The variety and variability among living organisms and the ecological complexes in which they occur. (Office of Technology Assessment report dated March 1987.)

3. Genetic Diversity. The various forms or qualities of those elements of germplasm that control transmission of hereditary characteristics.

4. Exotic Plants or Animals. Species not native to the place where found.

5. Special Management Areas. Certain lands within the National Forest System designated administratively or by Congress for special management consideration. Examples of administratively designated areas include Archeological Areas, Historical Areas, Geological Areas, Scenic Areas, National Recreation Trails, and Research Natural Areas. Examples of Congressional designations include Wilderness, National Primitive Areas, National Recreation Areas, National Scenic-Research Areas, National Scenic Trails, and National Historic Trails.

4063.1 - Size Standards. Research natural areas must be large enough to provide essentially unmodified conditions within their interiors. In the West, 300 acres (121.4 hectares) of land is generally considered the minimum size. In the East, where it may be impossible to find areas of 300 or more acres, consider establishing smaller areas, especially in grassland systems and in areas with special vegetative, aquatic, or geologic situations. Incorporate enough acres to ensure unmodified conditions within their interiors and to protect the features and/or qualities for which the research natural area is to be established.

4063.2 - Selection. Locate those research natural areas that best represent the ecological conditions needed to complete the natural area system in areas where conflicting uses are minimal. Whenever possible, select proposed areas that show no evidence of major disturbances by humans, such as livestock grazing or timber cutting, for the past 50 years. Where possible, select entire small drainages because they maintain interrelationships of terrestrial and aquatic systems, particularly valuable as baseline areas for research and monitoring, and because they are easier to delineate and protect on the ground.

In the selection of representative areas, a pristine condition is the goal. However, when candidate areas in a pristine condition are unavailable, then areas that reflect the pristine condition as closely as possible may be selected.

In certain geographic regions and in certain community types, it will be impossible to find candidate areas not containing exotic plant or animal life. Under these circumstances, the best available area that qualifies in all other respects should be chosen.

Do not regard failure to withdraw an area from mineral entry as a deterrent to selection and establishment of a desirable research natural area (FSM 4063.35)

OVERVIEW APPENDIX II. Framework for research natural area (RNA) establishment in the Eastern Region of the Forest Service as given in the Regional Guide (USDA Forest Service 1983c, Table 3-21)

Targets for Locating, Evaluating, and Establishing Research Natural Areas for the Eastern Region, January 1982

(Society of American Forester Numbers and Forest Cover Types)

Priority #1 **Unrepresented Forest Cover Types**	Priority #2 **Forest Cover Types Represented Once**	Priority #3 **Forest Cover Types Represented Twice**
Chippewa, Superior, Nicolet, Chequamegon, Ottawa, Hiawatha, and Huron-Manistee National Forests		
13 Black spruce - tamarack 17 Pin cherry 18 Mixed swamp conifer 20 White pine - northern red oak - red maple 26 Sugar maple - basswood 51 White pine - chestnut oak 52 White oak - black oak - northern red oak 108 Red maple	14 Northern pin oak 21 Eastern white pine 23 Eastern hemlock 25 Sugar maple - beech - yellow birch 37 Northern white cedar 38 Tamarack 39 Black ash - American elm - red maple 55 Northern red oak	5 Balsam fir 15 Red pine 24 Hemlock - yellow birch
Green Mountain and White Mountain National Forests		
5 Balsam fir 13 Black spruce - tamarack 16 Aspen 17 Pin cherry 19 Gray birch - red maple 22 Red spruce - sugar maple - beech 33 Red spruce - balsam fir 35 Paper birch - red spruce - balsam fir 37 Northern white cedar 38 Tamarack 45 Pitch pine 46 Eastern red cedar 55 Northern red oak 107 White spruce 108 Red maple	18 Paper birch 25 Sugar maple - beech - yellow birch 32 Red spruce	

Priority #1, cont.	Priority #2, cont.	Priority #3, cont.
Wayne, Allegheny, and Monongahela National Forests		
17 Pin cherry 22 White pine - hemlock 26 Sugar maple - basswood 27 Sugar maple 32 Red spruce 33 Red spruce - balsam fir 34 Red spruce - Fraser fir 43 Bear oak 44 Chestnut oak 46 Eastern red cedar 50 Black locust 51 White pine - chestnut oak 53 White oak 55 Northern red oak 57 Yellow-poplar 58 Yellow-poplar - eastern hemlock 59 Yellow-poplar - white oak - northern red oak 61 River birch - sycamore 62 Silver maple - American elm 64 Sassafras - persimmon 109 Hawthorn	23 Eastern hemlock 25 Sugar maple - beech - yellow birch 28 Black cherry - maple 60 Beech - sugar maple	
Hoosier, Shawnee, and Mark Twain National Forests		
46 Eastern red cedar 50 Black locust 52 White oak - black oak - northern red oak 53 White oak 61 River birch - sycamore 65 Pin oak - sweetgum 110 Black oak	40 Post oak - blackjack oak 59 Yellow-poplar - white oak - northern red oak 60 Beech - sugar maple	

OVERVIEW APPENDIX IIA. Status of Eastern Regional Guide's research natural area targets based on Society of American Foresters (SAF) forest cover types, as of October 1999

Cover types listed in parentheses were not included in the original Table 3-21 of the Regional Guide (USDA Forest Service 1982). Numbers in brackets represent the number of RNAs that have some acreage of this cover type (natural or plantation) regardless of acreage. For further information about which RNAs and acreage are involved, see Appendix IIB.

Priority #1 **Unrepresented Forest Cover Types**	Priority #2 **Forest Cover Types Represented Once**	Priority #3 **Forest Cover Types Represented Twice**	**Forest Cover Types Represented More than Twice**
Chippewa, Superior, Nicolet, Chequamegon, Ottawa, Hiawatha, and Huron-Manistee National Forests			
17 Pin cherry 20 White pine - northern red oak - red maple 51 White pine - chestnut oak	(22 Hemlock – white pine) 52 White oak - black oak -northern red oak (60 Beech – sugar maple) 108 Red maple (110 Black oak)	14 Northern pin oak	5 Balsam fir [3] 13 Black spruce – tamarack [5] 15 Red pine [8] 18 Paper birch [5] 21 Eastern white pine [6] 23 Eastern hemlock [3] 24 Hemlock - yellow birch [6] 25 Sugar maple - beech - yellow birch [8] 26 Sugar maple – basswood [5] 37 Northern white-cedar [7] 38 Tamarack [3] 39 Black ash - American elm - red maple [7] 55 Northern red oak [3]

16 Aspen	5 Balsam fir	25 Sugar maple - beech - yellow birch	
17 Pin cherry	13 Black spruce - tamarack		
19 Gray birch - red maple	18 Paper birch		
22 White pine - hemlock	32 Red spruce		
24 Hemlock - yellow birch	33 Red spruce - balsam fir		
27 Sugar maple	35 Paper birch - red spruce - balsam fir		
30 Red spruce - yellow birch			
31 Red spruce - sugar maple - beech			
37 Northern white cedar			
38 Tamarack			
45 Pitch pine			
46 Eastern red cedar			
55 Northern red oak			
107 White spruce			
108 Red maple			

Priority #1, cont.	Priority #2, cont.	Priority #3, cont.	**Forest Cover Types Represented More than Twice**
		Wayne, Allegheny, and Monongahela National Forests	
17 Pin cherry 22 White pine - hemlock 26 Sugar maple - basswood 27 Sugar maple 32 Red spruce 33 Red spruce - balsam fir 34 Red spruce - Fraser fir 43 Bear oak 44 Chestnut oak 46 Eastern red cedar 50 Black locust 51 White pine - chestnut oak 53 White oak 55 Northern red oak 57 Yellow-poplar 58 Yellow-poplar - eastern hemlock 59 Yellow-poplar - white oak - northern red oak 61 River birch - sycamore 62 Silver maple - American elm 64 Sassafras - persimmon 109 Hawthorn	23 Eastern hemlock 25 Sugar maple - beech - yellow birch 28 Black cherry - maple (52 White oak - black oak - northern red oak) (79 Virginia pine)	60 Beech - sugar maple	
		Hoosier, Shawnee, and Mark Twain National Forests	
50 Black locust 61 River birch - sycamore	(62 Silver maple - American elm) (64 Sassafras - persimmon) 65 Pin oak - sweetgum (76 Shortleaf pine - oak) (87 Sweetgum - yellow poplar) (93 Sugarberry - American elm-green ash)	(44 Chestnut oak) 46 Eastern red cedar	40 Post oak - blackjack oak [9] 52 White oak - black oak -northern red oak [10] 53 White oak [5] 59 Yellow-poplar - white oak - northern red oak 4] 6 Beech - sugar maple [5] 110 Black oak [4]

OVERVIEW APPENDIX IIB. Eastern Region established research natural areas (RNAs) as of October 1999, listed by Society of American Foresters (SAF) forest cover types

Acreage for the cover type within each RNA is given following the RNA name.

SAF COVER TYPES	RNA(s), acres of cover type
1- Jack Pine	Keeley Creek, 420 Lac La Croix, * Moquah, 165 Nordhouse Dunes, 30 Pine Point, 28 *no acres given; reported as 79,000 board feet in the 973-acre RNA
5 - Balsam Fir	Grandma Lake Wetlands, 16 Keeley Creek, * Lac La Croix, ** Nancy Brook, 119 *no acres given; reported as 18 cords of balsam fir in the 640-acre RNA **no acres given; reported as 134,000 board feet in the 973-acre RNA
12 - Black Spruce	Keeley Creek, 240 Lac La Croix, * Marble Lake Lookout, 12 McCarthy Lake and Cedars, 12 McCormick, 173 *no acres given; reported as 255,000 board feet in the 973-acre RNA
12E - Black Spruce-Speckled Alder	Nordhouse Dunes, 12
13 - Black Spruce-Tamarack	Bose Lake, 3 Clustered Bur Reed, 5.5 Grandma Lake Wetlands, 140 McCarthy Lake and Cedars, 21 Nancy Brook, 15 Tucker Lake Hemlocks, 12
14 - Northern Pin Oak	Moquah, 50 Newaygo Prairies, 42
15 - Red Pine	Battle Point, 42 Clustered Bur Reed, 1.5 Hayes Tower, 6.5 Lac La Croix, 145 (15% of the 973-acre RNA) McCarthy Lake and Cedars, 6 (plantation) McCormick, 11 Pine Point, 550.5 Schroeder, 5 (plantation)

16 – Aspen	Battle Point, 11 Bose Lake, 18 Clustered Bur Reed, 49 Grandma Lake Wetlands, 60 Hayes Tower, 220 Horseshoe Bay, 8 Keeley Creek, * Lac La Croix, 390 (40% of 973-acre RNA) McCarthy Lake and Cedars, 26 McCaslin Mountain, 191 Moquah, 180 Pine Point, 94.85 Stony Point, 92 Tucker Lake Hemlocks, 26 * no acres given; reported as 534 cords in the 640-acre RNA
18 - Paper Birch	Bose Lake, 19 Lac La Croix, * Marble Lake Lookout, 8 McCormick, 117 The Bowl, 16 Tucker Lake Hemlocks, 13 * no acres given; reported as 288,000 board feet in the 973-acre RNA
21 - White Pine	Horseshoe Bay, 16 Keeley Creek, * Lac La Croix, 145 (15% of 973-acre RNA) McCarthy Lake and Cedars, 5 McCormick, 219 Newaygo Prairies, 65 *no acres given; reported as 40,000 board feet in 640-acre RNA
22 - Hemlock-White Pine	McCormick, 33
23 - Hemlock	Bose Lake, 25 Dukes, 5 McCormick, 5 Tionesta, 1644
24 - Hemlock-Yellow Birch	Dukes, 32 Grand Island, 18 McCarthy Lake and Cedars, 14 McCormick, 95 Memorial Grove Hemlocks, 64 Tucker Lake Hemlocks, 68

25 - Sugar Maple-Beech-Yellow Birch	Bose Lake, 7 Grand Island, 40 Grandma Lake Wetlands, 98 Hayes Tower, 20 Horseshoe Bay, 30 McCarthy Lake and Cedars, 13 McCormick, 1515 The Bowl, 96 The Cape, 274 Tionesta, 19 Twin Lakes Bog, 7.7
26 - Sugar Maple-Basswood	Battle Point, 121 Bose Lake, 8 Chequamegon Hardwoods, 75 McCaslin Mountain, 9 Tucker Lake Hemlocks, 21
27 - Sugar Maple	Dukes, 94 Marble Lake Lookout, 60 McCormick, 466 Schroeder, 278
28 - Black Cherry-Sugar Maple	Tionesta, 50
32 - Red Spruce	The Bowl, 55
33 - Red Spruce-Balasam Fir	Nancy Brook, 356
35 - Paper Birch-Red Spruce-Balsam Fir	Nancy Brook, 895
36 - White Spruce-Balsam Fir-Paper Birch	Horseshoe Bay, 118 McCormick, 18
37 - Northern White Cedar	Dukes, 45 Horseshoe Bay, 1546 Lac La Croix, * Marble Lake Lookout, 15 McCarthy Lake and Cedars, 106 McCormick, 185 Schroeder, 77 * no acres given; reported as 26 poles in 973-acre RNA
38 - Tamarack	Horseshoe Bay, 26 Tucker Lake Hemlocks, 15 Twin Lakes Bog, 25
39 - Black Ash-American Elm-Red Maple	Chequamegon Hardwoods, 5 Dukes, 57 Horseshoe Bay, 53 Marble Lake Lookout, 28 McCaslin Mountain, 9 Spider Lake, 94 Stony Point, 225

40 - Post Oak-Blackjack Oak	Atwood Ridge, 275 Barker Bluff, 40 Burke Branch, 20 Cave Hill, 180 Dennison Hollow, 40 LaRue-Pine Hills/Otter Pond, * Ozark Hill Prairie, 25 Panther Hollow, 40 Stoneface, 91 * 630 acres in SAF 40 and 110 (not specified how much in each)
44 - Chestnut Oak	Atwood Ridge, 200 Dennison Hollow, 15
46 – Eastern Red Cedar	Barker Bluff, 6 Whoopie Cat Mountain, 1.4
52 - White Oak-Black Oak-Northern Red Oak	Atwood Ridge, 300 Barker Bluff, 14 Burke Branch, 100 Cave Hill, 135 Dennison Hollow, 50 Hayes Tower, 83 LaRue-Pine Hills/Otter Pond, 270 Ozark Hill Prairie, 290 Panther Hollow, 120 Stoneface, 30 Whoopie Cat Mountain, 15.6
53 - White Oak	Burke Branch, 36 Cave Hill, 90 Dennison Hollow, 46 LaRue-Pine Hills/Otter Pond, 70 Stoneface, 25
55 - Northern Red Oak	Battle Point, 68 McCaslin Mountain, 282 Moquah, 45
59 - Yellow Poplar-White Oak-Northern Red Oak	Burke Branch, 50 LaRue-Pine Hills/Otter Pond, 50 Ozark Hill Prairie, 190 Pioneer Mothers, 88
60 - Beech-Sugar Maple	Atwood Ridge, 180 LaRue-Pine Hills/Otter Pond, 50 McCaslin Mountain, 25 Ozark Hill Prairie, 10 Panther Hollow, 02 Reas Run, 42 Tionesta, 400
62 - Silver Maple-American Elm	LaRue-Pine Hills/Otter Pond, 345
64 - Sassafras-Persimmon	Ozark Hill Prairie, 20
65 - Pin Oak-Sweetgum	LaRue-Pine Hills/Otter Pond, 345
76 - Shortleaf Pine-Oak	LaRue-Pine Hills/Otter Pond, 35

79 - Virginia Pine	Reas Run, 35
87 - Sweetgum-Yellow Poplar	LaRue-Pine Hills/Otter Pond, 20
93 - Sugarberry-American Elm-Green Ash	LaRue-Pine Hills/Otter Pond, 770
108 - Red Maple	Nordhouse Dunes, 120
110 - Black Oak	Cave Hill, 60 Dennison Hollow, 42 LaRue-Pine Hills/Otter Pond * Nordhouse Dunes, 127 Stoneface, 30 * 630 acres in SAF 40 and 110 (not specified how much in each)
Non-forest	Alpine Gardens, 100 – alpine tundra, some krumholz Bose Lake, 1 – non-forest wetland Clustered Bur Reed, 13.8 – open bog Grandma Lake Wetlands, 2 – non-forest uplands; 135 – non-forest wetlands Horseshoe Bay, 313 – wetlands; 37 – beach McCarthy Lake and Cedars, 85 – lowland brush McCaslin Mountain, 8 – non-forest upland Moquah, 110 – open grassland Newaygo Prairie, 73 – non-forest Nordhouse Dunes, 456 – non-forest Pine Point, 503 – meadow Tucker Lake Hemlocks, 3 – lowland brush Twin Lakes Bog, 3 – open bog

OVERVIEW APPENDIX III. Other Forest Service approaches to research natural area representation by Region

Region 1 (Northern):

Documents:

1. USDA Forest Service. 1983a. The Northern Regional Guide. USDA Forest Service, Northern Region, Missoula, MT. [Research Natural Areas discussed on pp. 219-226 and Appendix A].

2. Chadde, S.W., S.F. Kimball, and A.G. Evenden. 1996. Research Natural Areas of the Northern Region: Status and Needs Assessment. USDA Forest Service, Northern Region and Intermountain Research Station, Natural Areas Program. 179 pp.

Representation:

1. Representation and Forest RNA target assignments in the 1983 Regional Guide were based on "forest" and "nonforest" habitat types, with the nonforest types including grasslands and shrublands, as well as alpine types. Aquatic assignments were based on "aquatic types and subtypes," using a predominantly physical classification (e.g., Type 1 stream, waterfall, cold springs, etc.). The sources or original references for these vegetation and aquatic classifications are not known.

2. Representation in the 1996 status assessment is based broadly on sections, and at a finer scale on alliances and community elements, within 4 analysis areas (Northern Idaho; Western Montana; Central and Eastern Montana; and North and South Dakota).

Region 2 (Rocky Mountain):

Document:

USDA Forest Service. 1993. Research natural area guide for the Rocky Mountain Region: Review draft. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 37 pp.

Representation:

Representation is based plant associations within sections (ecosubregions).

Region 3 (Southwestern):

Document:

USDA Forest Service. 1984. Progress Report Research Natural Areas. Southwestern Region. 16pp.

Representation:

Representation for New Mexico and Arizona is based on a series-level classification in the Regional Guide (USDA Forest Service 1983d). Ecosystem representations are based upon biotic communities (Brown 1983) and cross-walked to national classifications by Kuchler (1964) and the Society of American Foresters (Eyre 1980). To integrate with Forest planning and mapping, a Terrestrial Ecosystem Survey designation for each ecosystem is also given (Carleton and Brown 1983, USDA Forest Service 1983e).

Region 4 (Intermountain):

Documents:
"Needs lists" for Region 4 are given in separate documents by state:

Idaho

Wellner, C.A. and F.D. Johnson (compilers). mid 1970's. Research natural area needs in Idaho. USDA Forest Service, unpublished report. [informally known as the "Redbook"]

Nevada/Utah

Van Pelt, Nicholas (compiler). 1982. Research natural area needs in Nevada and Utah. Unpublished report, workshop Salt Lake City, UT. The Nature Conservancy.

Wyoming

Collins, Ellen I. (compiler). 1984. Wyoming natural area needs workshop proceedings. Riverton, WY. Wyoming Natural Heritage Program.

Representation:

Representation is Society of American Foresters and Rangeland Cover Types, Kuchler Types, Plant Associations, and Community Types within Bailey's Ecoregions (at the section and, where possible, the subsection levels).

Region 5 (Southwest):

Document:

Keeler-Wolf. 1990. Ecological surveys of Forest Service research natural areas. USDA Forest Service Pacific Southwest Research Station, General Technical Report PSW-125, Berkeley, California. 177 pp.

Representation:

Most frequently "target elements" are plant communities from California described in various ecological reference works (*e.g.*, Barbour and Major 1977, Eyre 1980, Kuchler 1966, Munz and Keck 1959). Other unique ecosystems are also included. Where possible, a representative RNA is selected for each of the 61 target elements in each of the 10 major physiographic provinces of the state. Target elements are being changed, and many new non-forest and aquatic types are being added.

Region 6 (Pacific Northwest):

Documents:

Region 6 uses two guides: The Washington Natural Heritage Plan (updated every 2 years) and the Oregon Natural Heritage Plan (updated every 5).

Representation:

These documents divide the states into geographic provinces or ecoregions. Within each of these provinces are lists of the important terrestrial and aquatic ecosystems. The emphasis has always been more on representative, though the unique and special types are there. The classification is mainly built around plant community and aquatic classifications done by the Forest Service area ecology program along with extensive Bureau of Land Management work done by an Oregon State University cooperative effort that worked on the coast and in southwest Oregon. The rest of the classification is taken from the published literature.

Region 8 (Southern):

Document:

Region 8 has an Interim Product from Challenge Cost-Share No. 08-96-NR-CCS-03 with The Nature Conservancy (Southeast Regional Office)

Representation:

Representation is based on alliances within subsections found on U. S. Forest Service land in Region 8; the interim report lists alliances potentially occurring in each Region 8 RNA.

Region 10 (Alaska):

Documents:

USDA Forest Service. 1983b. Regional guide for the Alaska Region. USDA Forest Service, Juneau, AK. Appendix A, pp A-1 – A-23.

Chugach National Forest:

The methodology is summarized in the unpublished report (on file) entitled "RNA Representativeness Analysis".

Tongass National Forest:

Juday, G., P. Alaback, and M. Orme. 1988. Research natural area proposals for the Tongass Forest Plan revision...results of Research Natural Area Workshops, May 24 and 25 and July 21, 1988. Tongass National Forest, Juneau, Alaska. 79 pp. plus Appendix. Ref. 2395.

USDA Forest Service. 1997. Environmental Impact Statement for the Land and Resources Management Plan for the Tongass National Forest. USDA Forest Service, Juneau, AK.

Representation:

The Alaska Regional Guide identified plant communities, shrub species, geologic landforms, and animal species to be included in a network of RNAs in Southeast (Tongass National Forest) and Southcentral (Chugach National Forest) Alaska. Plant community representation (forests, tundra, shrubland, herbaceous, and aquatic) is based on Level V (for Southeast Alaska) and on Level IV (for Southcentral Alaska) of the plant community classification system (Viereck and Dyrness 1980).

Chugach National Forest:

The Chugach approach is based on the premise that a key reason RNAs are established is to maintain a representative set of natural biological diversity in baseline areas. A Forest-wide bioenvironmental database of generalized climate, vegetation, and landform is used as a surrogate for biological diversity. The Conservation Option and Decisions Analysis (CODA) program (Bedward *et al.* 1992) is used as an automated/repeatable procedure to identify a representative network of sites based on the bioenvironmental database.

Tongass National Forest:

Framework based on representing a number of vegetation, aquatic, and wildlife types or habitats characteristic of each of 7 broad ecological units (termed Geographic Provinces).

OVERVIEW APPENDIX IV. Nomenclature for alliances (from Grossman *et al.* 1998)

The names of dominant and diagnostic species are the foundation of the alliance name. At least one species from the dominant and/or uppermost stratum (vegetation layer) is included; rarely, in cases where the combination of upper and lower strata species is strongly diagnostic, species from other strata are included as well. Species occurring in the same stratum are separated by a hyphen (-), and those occurring in a different strata are separated by a slash (/). Species occurring in the uppermost stratum are listed first, followed successively by those in lower strata. In physiognomic types where there is a dominant herbaceous layer with a scattered woody layer, alliance names can be based on species found in either the herbaceous layer or the woody layer, whichever is more diagnostic of the type.

Species less consistently found in all associations of the alliance may be placed in parentheses and these parenthetical names are generally listed alphabetically. In cases where a particular genus is dominant or diagnostic, but individual species of the genus may vary among associations, only the specific epithets are placed in parentheses.

Vascular plant species nomenclature follows the nationally standardized list, Kartesz (1994), with very few exceptions. Nomenclature for nonvascular plants follows Anderson (1990), Anderson et al. (1990), Egan (1987, 1989, 1990), Esslinger and Egan (1995), and Stotler and Crandall-Stotler (1977).

A maximum of four species is currently allowed in an alliance name; fewer are desirable.

Examples of Alliance names include:

Pseudotsuga menziesii Forest Alliance
Pinus rigida Woodland Alliance
Fagus grandifolia - Magnolia grandiflora Forest Alliance
Juniperus virginiana - (Fraxinus americana, Ostrya virginiana) Woodland Alliance
Andropogon gerardii - (Calamagrostis canadensis, Panicum virgatum) Herbaceous Alliance
Pinus virginiana - Quercus (coccinea, prinus) Forest Alliance
Pinus palustris / Quercus spp. Woodland Alliance
Artemisia tridentata ssp. *wyomingensis* Shrubland Alliance

Note that alliance names conclude with the formation class (*e.g.*, "Forest," "Woodland," "Herbaceous") in which they are classified, followed by the word "alliance." Use of the word "alliance" in the name distinguishes these types from associations. Exceptions are types in the Sparse Vegetation Class which are not based on floristics; these do not include the word "alliance" in the name.

For all wetland alliances, the formation—which indicates the hydrologic regime in which the alliance is found—is also provided for clarity (*e.g.*, *Acer saccharinum* Temporarily Flooded Forest Alliance). Alliances may be assumed to be upland types when the name lacks a hydrologic modifier.

Modifiers descriptive of the height of the vegetation or of environmental conditions are used sparingly, primarily in cases where the alliance name would not otherwise be unique (*e.g.*, *Picea sitchensis* Giant Forest Alliance, *Quercus alba* Montane Forest Alliance).

Alliance names generally do not include infraspecific taxa unless such taxa are particularly diagnostic.

A genus name followed by the abbreviation "spp." is used to indicate that the alliance contains numerous mixed species of that genus or that the species are unknown.

OVERVIEW APPENDIX V. General Framework of Aquatic Ecological Unit Hierarchy

The diagram of the framework of aquatic ecological units is Figure 1 from Maxwell *et al.* (1995).

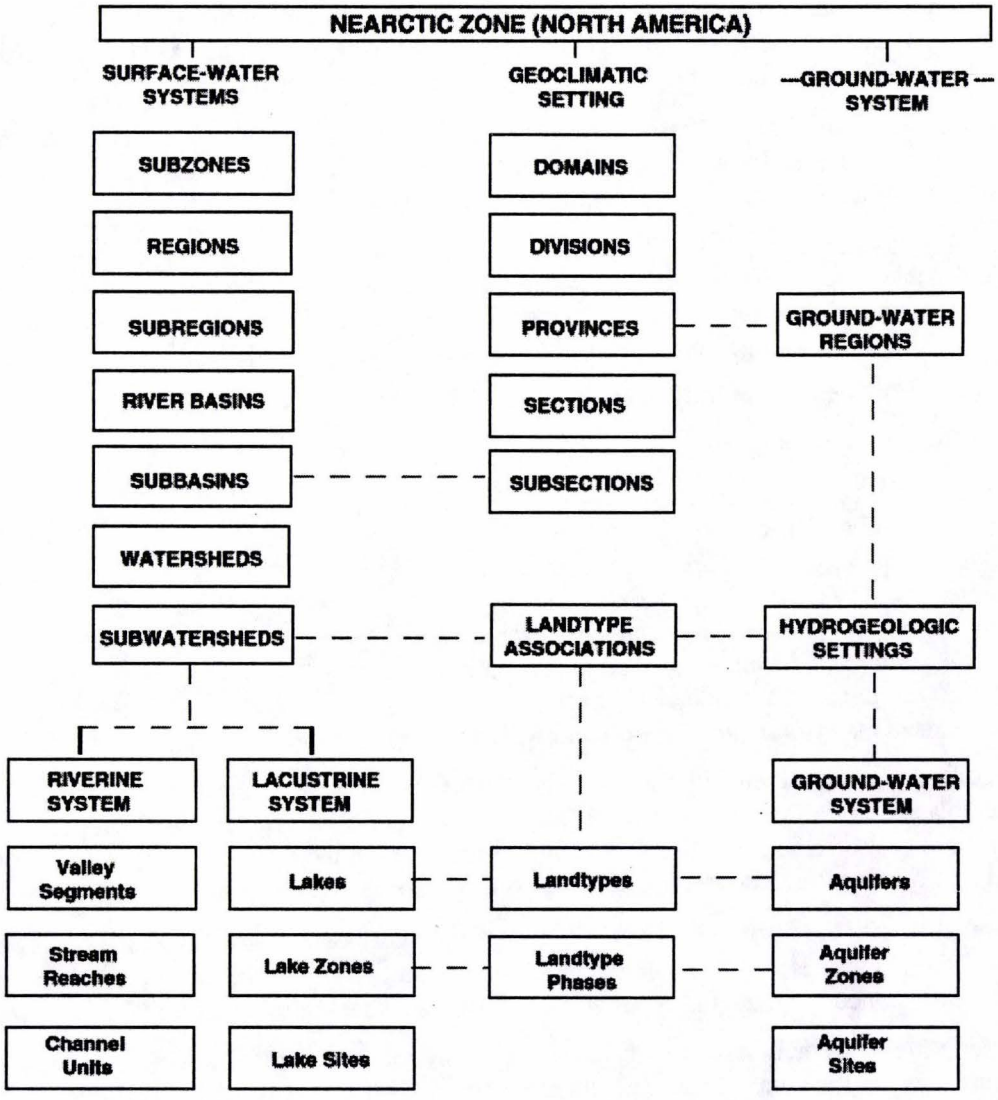


Figure 1.—*General framework of aquatic ecological unit hierarchy. Sizes of units decrease from top to bottom. Larger hydrologic units and ground-water regions are regionalized based on zoogeography and physiography. Smaller aquatic systems are classified based on biophysical criteria and are nested within these overlying settings. Primary functional linkages between aquatic systems and terrestrial (geoclimatic) systems are shown as dashed lines.*

OVERVIEW APPENDIX VI. Excerpts from The Nature Conservancy's classification for aquatic ecosystems and aquatic communities

The Nature Conservancy is developing a document for publication that describes an approach to classifying aquatic ecosystems and aquatic communities that can be used nationally and internationally. The following are excerpts from interim publications summarizing preliminary work on this effort. The two excerpts provided here are: (A) Definitions of classification framework levels, and (B) The Nature Conservancy's aquatic classification for stream and lake macrohabitats in the Great Lakes Ecoregion.

Overview Appendix VI.A. Definitions of classification framework levels*

Level	Description	Key Variables
Ecoregion	Large areas of similar climate and physiography that correspond to broad vegetation regions.	Climate Physiography General physiognomy of the vegetation
Ecological Group	Aggregates of watersheds that share ecological and biological characteristics. Ecological groups contain sets of aquatic systems with similar patterns of hydrologic regime, gradient, drainage density, & species distribution.	Physiography Zoogeography Watershed
Macrohabitat Type	Types of small to medium-sized lakes or lake basins, and valley segment types of streams within ecological groups. Note: lentic, lotic, and nearshore ecosystems are treated separately.	Surficial geology Local physiography Size, shape, and network position
Habitat Unit Type	Distinct subunits of macrohabitats that capture the physical variability.	Depth and light penetration Velocity (lotic) Substrate
Alliance	Coarse level of biological community organization. Corresponds spatially to macrohabitats.	Taxa that are diagnostic of groups of associations
Association	Finest scale of biological classification. Corresponds spatially to either macrohabitats or habitat units.	Repeating, distinct species assemblages

*This table is Table 1 excerpted from Higgins *et al.* (1999).

Overview Appendix VI.B. The Nature Conservancy's aquatic classification for stream and lake macrohabitats in the Great Lakes Ecoregion

The information tables provided here are Table 5.1, 5.3, 5.5 and 5.7 from Higgins *et al.* (1998).

STREAMS: Stream macrohabitat types were defined as unique combinations of four variable classes that occur within an ecoregional section. The macrohabitat types were stratified by ecoregional section to account for large-scale patterns of climate and physiography.

Variables used to classify stream macrohabitats in the Great Lakes Ecoregion:

A. Hydrologic regime

Class Code	Class name*	Original hydrology code*
32	High groundwater/very low runoff	32
31	High groundwater/low runoff	31
23	Moderate groundwater/moderate runoff	23
22	Low groundwater/high runoff	22
21	Very low groundwater /very high runoff	21
10	Wetlands	13,12,11

B. Gradient

Class Code	Class name	Gradient interval
1	Low	0.0 - 0.019
2	Medium	0.002 - 0.02
3	High	> 0.02

C. Size

Class code	Class name	Link number
1	Very small	0-2
2	Small	3-10
3	Medium	11-50
4	Medium-large	51-200
5	Large	201-600
6	Extra-large	> 600

D. Connectivity

Class Code	Class name*	Connectivity classes*	D-link
1	Small stream	1,8	< 11
2	Medium stream	1,8	11 - 200
3	Large stream	1,8	> 200
4	Lake	2,3,4	-
5	Coastal	5	-
6	Estuarine	6	-
11	Unconnected	7	-
8	Wetland	9	-

Examples of stream macrohabitat type codes:

Macrohabitat type code	Hydrologic Regime	Gradient	Stream Size	Connectivity
21323	very low groundwater/very high runoff	high	medium	large stream
23111	mod. groundwater /mod. runoff	low	very small	small stream
31232	high groundwater /low runoff	medium	medium	medium stream
32253	very high groundwater/very low runoff	medium	large	large stream

LAKES: Lake macrohabitat types were defined as unique combinations of four variables that occur within an ecoregional section. Macrohabitat types were stratified by ecoregional section to account for large-scale patterns of climate and physiography.

Variables used to classify lake macrohabitats in the Great Lakes Ecoregion:

A. Connectivity

Class code	Description	Drainage network position*
1	Connected	>=1
0	Unconnected	0

B. Size

Class code	Name	Area (ha)
1	Small	0-9
2	Medium	10-99
3	Large	100-1000
4	Extra large	>1000

C. Shoreline complexity

Class code	Name	Shoreline complexity*
1	Round	.97-1.02
2	Elongate	1.03-2.03
3	Complex	>2.03 and <= 4.0
4	Very complex	>4.0

D. Hydrologic regime

Class code	Name*	Drainage network position*	Surficial geology
14	Catchment/wetland	0,1,2	Peatland
13	Catchment/groundwater	0,1,2 (if size >2)	Coarse sand and gravel
12	Catchment/mixed	0,1,2 (if size >2)	Coarse moraine
11	Catchment/runoff	0,1,2 (if size >2)	Fine moraine and lake plain
24	Surface/wetland	>=3	Peatland
23	Surface/groundwater	2 (size <=2), >=3	Coarse sand and gravel
22	Surface/runoff	2 (size <=2), >=3	Everything else

* see reference for descriptions of these variables.

Examples of lake macrohabitat type codes:

Macrohabitat type code	Connectivity	Lake size	Shoreline complexity	Hydrologic regime
1111	unconnected	small	round	catchment/runoff
1213	unconnected	medium	elongate	catchment/groundwater
11312	connected	small	complex	catchment/mix
14221	connected	large	elongate	surface/runoff

OVERVIEW APPENDIX VII. Selected state Heritage Program aquatic classifications

VII.A. Illinois

White, John. 1978. Illinois Natural Areas Inventory Technical Report Volume I. Survey Methods and Results. Illinois Natural Areas Inventory, Urbana, Illinois. 426 pp. [excerpt from pages, 318; 347-350]

LAKE & POND

Lakes and ponds are bodies of open, standing water. They are separated from wetlands by the general lack of emergent woody or graminoid vegetation. There are two subclasses: *pond* and *lake*.

I. **Pond** – Only one pond natural community is recognized. All ponds in Illinois, even those associated with bogs, appear to be eutrophic, not dystrophic or oligotrophic.

   Pond--A pond is a small, still body of water, usually shallow enough to allow rooted aquatic plants across most of it. A pond is given natural community status only if it is *permanent* or *semi-permanent*, not seasonal or ephemeral.

II. **Lake** – The distinction between a *lake* and a *pond* is difficult to make, but it can be made with natural characteristics rather than by size alone. A lake has an area of deep water sufficiently large to produce somewhere on its periphery a barren, wave-swept shore. A barren, wave-swept shore is distinguished by an absence of attached aquatic plants, and absence of finely divided organic matter on the bottom, an absence of air-breathing invertebrates, and the presence of only those invertebrates that maintain their position by burrowing. Thermal stratification is usually present in a lake, but not always present in ponds. Two lake natural communities are recognized: *lake* and *great lake*.

   Lake--The natural lakes in Illinois can all be classified as eutrophic.

   Great lake—This is Lake Michigan, a deep, naturally oligotrophic body of water, which has suffered some eutrophication along the Illinois shore.

STREAM

Streams are flowing waters. Streams must be permanent, not intermittent or ephemeral (flowing only after rains) to be considered as distinct natural communities instead of features of another community. Although stream communities intergrade, two community classes are recognized on the basis of size: *creek* and *river*.

I. **Creek** – A creek is defined as a perennial stream with a watershed smaller than 200 square miles (520 square kilometers). Three creek communities are identified on the basis of their gradients.

   Low-gradient creek--A low-gradient creek has a gradient of less than 1 foot per mile (0.2 meters per kilometer). The current is sluggish, there are no riffles, and the sediments are silt and organic matter.

   Medium-gradient creek--A medium-gradient creek has a fall of between 1 and 10 feet per mile (0.2 to 1.9 meters per kilometer).

   High-gradient creek--This is a creek with a gradient of 10 or more feet per mile (1.9 or more meters per kilometer). Riffles, pools, and sand and gravel beds are characteristic of high-gradient creeks.

II. **River** – A river is a stream with a watershed of 200 square miles (520 square kilometers) or more. Three river communities (recognized by size and gradient) are identified.

   Low-gradient river--The gradient of this community is less than 1 foot per mile (0.2 meters per kilometer). The channel is meandering, and the current is sluggish. There may be sand bars, but the sediments are mainly silt.

   Medium-gradient river--The gradient of this community is between 1 foot and 10 feet per mile (0.2 to 1.9 meters per kilometer). Gravel riffles and raceways and sand bars are characteristic of this community.

Major river--A major river is one with a very wide and deep channel and a very large flow. All of the major rivers in Illinois are low-gradient streams.

VII.B. Maine

Maine Natural Heritage Program. 1991. Natural Landscapes of Maine: a Classification of Ecosystems and Natural Communities. Office of Comprehensive Planning, State House Station 130, Augusta, Maine 04333. 77pp.

RIVERINE COMMUNITIES – A river or stream will have more than one of these communities along its length; even with the same stretch of the river, open-water communities are distinguished from those with emergent or floating plants.

I. **Intermittent Stream Community** - Small, ephemeral streams with moderate to steep gradients where water flows only in the spring or after a heavy rain.

II. **Peatland Stream Community** - Small, cold, strongly colored streams that are high in tannic and humic acids. The biota of these streams is depauperate. More data are needed.

III. **Rocky Headwater Stream Community** - Small first- and second-order rocky streams with moderate to steep gradients and cold water. Most of the erosion is headward, and deposition is minimal. Gorges and waterfalls may be present where the streambed lies over bedrock.

IV. **Midreach Stream Community** - Third- and fourth-order streams with a well-defined pattern of pools and riffles. Most of the erosion is lateral. Small waterfalls and springs may be present. Variants based on substrate need documentation.

V. **Marsh Headwater Stream Community** - Small, slow, first- and second-order marshy brooks with low gradients and cool to cold water, flowing through wetlands. The substrate is gravel or sand, with silt or peat/muck deposits along the shore.

VI. **Deadwater Community** - Wide, flatwater sections of headwater and midreach streams where natural dams or constrictions in the river channel have caused partial impoundments. Waters are very slow, bottoms are sandy to silty, and oxygen levels are comparatively low.

VII. **Main Channel River Community** - Large, usually quiet, open-water sections of major rivers, fifth-order or higher, extending downstream to the upper limit of the head of tide. Main channel rivers may have meanders and/or alternating sections of erosion and deposition, depending on channel morphology. Riffles, if present, are typically separated by stretches of flatwater. Substrate varies from gravels and sands to silt, depending on hydrology and geomorphology. Main channel river segments can be important habitats for anadromous fish. Variants of this community based on substrate need documentation.

VIII. **Backwater Slough Community** - The aquatic community of sloughs or bogans in embayments and old meanders partially cut off from the main river channel. Waters are quiet, often stagnant, and aquatic vegetation is typically abundant.

IX. **Riverine Emergent Community** - A community of non-persistent emergents, and/or submerged or floating macrophytes, growing along protected rivershores where there is standing water throughout the year. Vegetation is a mixture of broad-leaved emergents, rushes, and floating plants. Characteristic species include *Pontederia cordata, Sparganium eurycarpum, Zizania aquatica, Ceratophyllum demersum, Nymphaea odorata, Nuphar variegatum*, and *Bidens* spp. Except for its inclusion in the riverine rather than the lacustrine system, this community appears to be essentially the same as the Lacustrine Emergent Community.

LACUSTRINE COMMUNITIES – Except for alkaline (hardwater) lakes, which are rare in Maine, these lake communities are distinguished by trophic status and turnover characteristics. Other variants (e.g. pH-based) may also exist, but need to be documented. Cultural inputs to most of these lake types can result in increased productivity and greater abundance of plants and algae.

I. **Tarn Community** - High elevation ponds, generally above treeline, with clear, cold, fairly acidic waters in a small, deep basin. Aquatic plants and algae are sparse. *Salvelinus alpinus* is a characteristic fish.

II. **Eutrophic Pond Community** - Shallow, warm-water, nutrient-rich ponds with abundant macrophytes and algae. Typical plants include *Potamogeton* spp., *Lemna* spp., *Nuphar variegatum*, and *Ceratophyllum* spp. Naturally eutrophic ponds in Maine are generally small; the eutrophication of larger lakes is due mostly to cultural inputs.

III. **Bog Pond Community** - Shallow, unstratified, low productivity (monomictic dystrophic) lakes darkly colored with tannic and humic acids. The acidic conditions slow decay, resulting in accumulation of muck on the lake bottom. Plant and animal species richness is low; the dominant organisms may include floating plants such as *Nymphaea odorata, Nuphar variegatum,* and *Brasenia schreberi.* (These plants are associated with other lake communities as well, however.) These acidic lakes are typically associated with peatlands.

IV. **Alkaline Pond Community** - "Hardwater" lakes or ponds with alkalinities ($CaCO_3$) greater than 50 ppm. These are rare in Maine, being more or less restricted to the limestone belt in southern Aroostook County. The alkaline waters may support distinctive flora including *Chara* spp. and the pondweeds *Potamogeton filiformis* and *P. vaginatus*. This community includes so-called marl ponds (only two of which are currently known in Maine), where carbonate ions precipitate, forming a calcium-rich marl deposit.

V. **Monomictic Oligotrophic Lake Community** - Open water and benthic community of shallow, low-productivity lakes that are typically unstratified. These lakes are characterized by high transparency and few floating plants and algae. Macrophyte species may include *Uticularia purpurea, Potamogeton epihydrus, Myriophyllum tenellum*, and *Nuphar variegatum*.

VI. **Monomictic Mesotrophic Lake Community** - Open water and benthic community of shallow (less than 5 m maximum depth), medium-productivity lakes that are typically unstratified. Rooted aquatic plants and algae are present in moderate numbers. Typical macrophytes include *Potamogeton* spp., *Polygonum amphibium, Nymphaea odorata, Nuphar variegatum*, and *Brasenia schreberi.* Mean summer Secchi disk readings are usually between 3.5 and 6 m.

VII. **Meromictic Lake Community** - Small, deep lakes in which the waters are so protected from winds that they do not mix, and become permanently chemically stratified. The one known example in Maine is a kettlehole. The bottom is anoxic, with high levels of dissolved salts, and as a result biotically depauperate.

VIII. **Dimictic Oligotrophic Lake Community** - Open water and benthic community of low-productivity lakes that turn over twice a year. These are typically deep (maximum depth greater than 12 m). Waters are clear, with mean summer Secchi disk readings usually greater than 6.5 m. Aquatic plants and algae are absent or sparse; as a result, the sediments are low in organic matter. Oxygen levels are typically high. Shallow spots may have bottom vegetation similar to that of monomictic oligotrophic lakes.

XI. **Dimictic Mesotrophic Lake Community** - Open water and benthic community of medium-productivity lakes that turn over twice a year; most have a maximum depth of more than twelve meters. Water transparency varies seasonally; mean summer Secchi disk readings are usually between 3.5 and 6 m. Sediments are higher in organic matter than in oligotrophic lakes. Plant species composition is similar to that of monomictic mesotrophic lakes.

X. **Rush Bed Community** - Wetlands usually found near inlets and outlets of larger lakes, dominated by tall bulrushes (including *Scirpus validus, Scirpus americanus*, and/or *Scirpus acutus*). Other emergents may occur in lesser amounts (see the Lacustrine Emergent community). Water depths are mostly over 6"; these is standing water for most or all of the year.

XI. **Lacustrine Emergent Community** - A community dominated by non-persistent emergents, and often with floating macrophytes along protected portions of lakeshores with standing water throughout the year. The vegetation is a mixture of broad-leaved emergents, rushes, and floating plants. Characteristic emergent species include *Pontederia cordata, Sparganium eurycarpum, Zizania aquatica, Nymphaea odorata, Nuphar variegatum*, and *Bidens* spp. Submersed species may include *Potamogeton* spp., *Ceratophyllum demersum, Utricularia vulgaris*, etc. This community is generally associated with other alluvial marsh communities. Except for its inclusion in the lacustrine rather than the riverine system, this community appears to be essentially the same as the Riverine Emergent Community.

XII. **Lacustrine Shallow Bottom Community** - Sandy (or somewhat muddy) shallows of lakes and ponds, where sufficient light penetrates to allow growth of aquatic bed vegetation. The community is dominated by small rosette-forming plants such as *Eriocaulon septangulare, Lobelia dortmanna*, and *Isoetes* spp. Plants are occasionally exposed at very low water levels. *Heteranthera dubia, Subularia aquatica* and *Littorella americana* have been found associated with this community.

VII. C. Missouri

Classification modified from:

Pflieger, William L. 1989. Aquatic community classification system for Missouri. Aquatic Series no. 19. Missouri Department of Conservation, Jefferson City, Missouri.

[RIVERS]

I. **Headwater**
II. **Creek**
III. **Small River**
IV. **Large River**

STANDING WATERS – This habitat consists of natural or man-made depressions that intersect the water table. Many are subject to frequent flooding by lowland streams. Typically, water levels fluctuate drastically on a seasonal basis. Current is absent except during floods. The water is warm and usually clear, often stained by organic acids. The substrate consists of silt, often overlain by varying quantities of leaves, sticks, and other organic debris.

SPECIAL COMMUNITIES

I. **Spring Branches (Freshwater)** – Temperature is an important factor affecting the distribution of the plants and animals of spring branches. At the spring source, the water temperature is about 58 °F year-round. As the water flows away from this source, it comes more and more under the influence of the air temperature, and ultimately takes on the fluctuating character of warmwater streams. The distance involved in affecting this change depends on the volume of flow and other factors. Some streams that receive one or more large springs remain cool enough to support a characteristic spring biota for many miles. Springs are subject to wide fluctuations in flow, but generally have better-sustained base flows than surface streams that are not spring-fed.

II. **Spring Branches (Mineral)** – The minerals in the spring water were entrapped in the sedimentary rocks at the time of their formation, and leached out by water derived from local precipitation. Mineral springs generally have a small but permanent flow. High salt and hydrogen sulfide concentrations are important determinants of the biota.

III. **Subterranean Streams** – The two physical features of greatest importance in determining the nature of the biota of subterranean streams are the absence of light and the constant temperature. Because of the absence of light, virtually all the energy to support the biota must be imported into the system by way of organic material that washes in or is brought in by animals that forage outside the system. The temperature of subterranean streams is near 58 ºF year around.

IV. **Overflow Waters** – Current is absent except when adjacent streams are in flood. The temperature is typically higher than in surface streams, unless the overflow pool is spring-fed. The substrate may be sand, gravel, or rubble, but these are often overlain by silt and organic debris. This habitat typically originates as an abandoned stream channel, and is proportional in size to the stream that formed it. Current is absent except during floods, and silt is the predominate substrate. Turbidity is usually high.

V. **Sinkhole Ponds** – Sinkhole ponds occur in depressions formed by the collapse or subsidence of the earth's surface into voids formed by the solution of carbonate rocks. Most sinkhole ponds do not intersect the water table, and are relatively shallow and subject to marked seasonal fluctuations in depth. Levels of dissolved oxygen are generally low. The water is often stained by organic compounds. The substrate is invariably silt and organic debris.

VII.D. New York

Reschke, Carol. 1990. Ecological Communities of New York State. New York Natural Heritage Program, Department of Environmental Conservation, Latham, NY.

RIVERINE SYSTEM (NATURAL STREAMS)

I. **Rocky headwater stream** - the aquatic community of a small- to moderate-sized rocky stream with a moderate to steep gradient, and cold water that flows over eroded bedrock in the area where a stream originates.

II. **Marsh headwater stream** - the aquatic community of small, marshy brook with a low gradient, slow flow rate, and cool to cold water that flows through a marsh, fen, or swamp in the area where a stream originates.

III. **Midreach stream** - the aquatic community of a stream that has a well-defined pattern of alternating pool, riffle, and run sections.

IV. **Main channel stream** - the aquatic community of a large, quiet, base level sections of streams where there are no distinct riffles.

V. **Backwater slough** - the aquatic community of quiet to stagnant waters in sloughs that form in embayments and old meanders that are partially cut off from a main channel stream by deposition of a levee.

VI. **Intermittent stream** - the community of a small, ephemeral streambed with a moderate to steep gradient, where water flows only during the spring or after a heavy rain.

VII. **Coastal plain stream** - the aquatic community of slow-moving, often darkly-stained streams of the coastal plain of Long Island.

LACUSTRINE SYSTEM (NATURAL LAKES AND PONDS)

I. **Great Lakes deepwater community** - the open water community in any of the Great Lakes.

II. **Great Lakes aquatic bed** - the aquatic community of the protected shoals of the Great Lakes that occur in quiet bays that are protected from extreme wave action, and support large areas of "weeds" or aquatic macrophytes.

III. **Great Lakes exposed shoal** - the aquatic community of the shallow littoral zone of the Great Lakes that occurs along windswept shores that are exposed to wave action.

IV. **Bog lake** - the aquatic community of a dystrophic lake that typically occurs in a small, shallow basin that is protected from wind and is poorly drained.

V. **Oligotrophic dimictic lake** - the aquatic community of a nutrient-poor lake that typically occurs in a deep, steeply banked basin.

VI. **Mesotrophic dimictic lake** - the aquatic community of a lake that is intermediate between an oligotrophic lake an a eutrophic lake.

VII. **Eutrophic dimictic lake** - the aquatic community of a nutrient-rich lake that occurs in a broad, shallow basin.

VIII. **Summer-stratified monomictic lake** - the aquatic community of a lake that is so deep (or large) that it has only one period of mixing or turnover each year (monomictic), and one period of stratification.

IX. **Winter-stratified monomictic lake** - the aquatic community of a lake that has only one period of mixing each year because it is very shallow in relation to its size (e.g. Oneida Lake, with a mean depth less than 20 ft and surface area of approx. 80 square miles), and is completely exposed to winds.

X. **Meromictic lake** - the aquatic community of a small and relatively deep lake that is so protected from wind-stirring that it has no annual periods of complete mixing, and remains chemically stratified throughout the year.

XI. **Marl pond** - the aquatic community of a small, shallow spring-fed pond in which the water has a high concentration of calcium; as a result of chemical or photosynthetic removal of carbon dioxide from the water, the calcium precipitates out of the water as calcium carbonate ($CaCO_3$).

XII. **Inland salt pond** - the aquatic community of a small, spring-fed pond in which the water is salty from flowing through salt beds in the aquifer.

XIII. **Oxbow lake** - the aquatic community of a small, shallow, usually stagnant lake or pond that occurs in an old river meander or oxbow that has been cut off from a main channel stream by deposition of a levee

XIV. **Coastal plain pond** - the aquatic community of the permanently flooded portion of a coastal plain pond with seasonally and annually fluctuating water levels.

XV. **Oligotrophic pond** - the aquatic community of a shallow, nutrient-poor pond.

XVI. **Eutrophic pond** - the aquatic community of a shallow, nutrient-rich pond.

VII. E. Vermont

Thompson, Liz. 1989. Natural communities of Vermont. Vermont Nongame and Natural Heritage Program, Agengy of Natural Resources, Fish and Wildlife Department. Waterbury, Vermont.

RIVERINE SYSTEM – This includes all deepwater habitats contained within a channel in which water is flowing. It does *not* include the wetlands, vegetated shores, or upland islands that are associated with rivers. The following classification is provisional, and will be amended when we have assembled better data on the relationships of gradient, temperature, nutrients, substrate, and available oxygen on the biota of stream systems. Note that a single stream or river may have more than one of the following classifications along its length.

I. **Spring Run Community** – The community inhabiting a spring or the area just below it; this community ends at the point where surface water is encountered.

II. **Seasonal Stream** – May cease to flow in summer. Characteristic species are roacklike stonefly and water moss (*Fontinalis*).

III. **High-Gradient Stream** – Rapidly flowing stream with bottom of bounlers or bedrock. Characteristic species: brook trout, mayflies, riverweed (*Podostemum ceratophyllum*).

IV. **Medium-Gradient Stream** – Moderate velocity stream with bottom of coarse sand or gravel. Characterized by large mussel beds.

V. **Low-Gradient Stream** – Slow-moving stream with bottom of fine sand or silt. Aquatic plants are often present.

VI. **Major River** – Large rivers with regular runs of anadromous fish.

LACUSTRINE SYSTEM – Lakes and ponds which are deep enough to have areas that are largely unvegetated on the surface. As a guideline, lacustrine systems are those which have less than 30% vegetative cover of trees, shrubs, emergents or floating-leaved aquatics.

I. **Tannic Water Lake/Pond** – water is distinctly tan-colored and the pond generally has a peaty bottom. Typical species: pondweed (*Potamogeton oakesianus*)

II. **Clear Soft Water Lake/Pond** – Unproductive system in which bottom is usually bare rock or sand, with little organic accumulation. Typical species: quillwort (*Isoetes echinospora*), pipewort (*Eriocaulon septangulare*) and water lobelia (*Lobelia dortmanna*).

III. **Moderately Rich Lake/Pond** – Productive system, but not eutrophic. Most of our lakes fall into this category.

IV. **Very Rich Lake/Pond** – Eutrophic system with abundant plant growth, water usually green with algae, deep organic muck bottom. Typical plants: coontail (*Ceratophyllum demersum*), duckweed (*Lemna minor*), water starwort (*Herteranthera dubia*). Rosette-leaved aquatics virtually lacking.

V. **Hard Water Lake/Pond** – (Marl pond) Leaf undersides of submergent aquatics thickly encrusted with calcium carbonate (marl). Vegetative diversity is low. Typical plants: stoneworts (*Chara* spp.), sago pondweed (*Potamogeton pectinatus*), pondweed (*Potamogeton strictifolius*), and water crowfoot (*Ranunculus aquatilus*).

VI. **Soft Water, High Elevation Lake/Pond** – (Tarn) slightly peaty bottoms, or occasionally bare rock bottoms. Plants are scattered. Typical species: little floating heart (*Nymphoides cordata*), common bladderwort (*Utricularia vulgaris*), pondweed (*Potamogeton confervoides*), and floating-leaf bur reed (*Sparganium angustifolium*).

VII. F. Wisconsin

Epstein, Eric. 1991. Natural Communities of Wisconsin. Wisconsin Heritage Program, Wisconsin Department of Madison, WI Natural Resources.

RIVERINE

I. **Spring/spring brooks –**
Springs and spring runs, hard,
Springs and spring runs, soft

II. **Creeks –**
Stream – fast, hard, cold;
Stream – fast, hard warm;
Stream – fast, soft, cold;
Stream – fast, soft, warm;
Stream – slow, hard, cold;
Stream – slow, hard, warm;
Stream – slow, soft, cold;
Stream – slow, soft, warm;
Small river - fast, hard, cold;
Small river – fast, hard warm;
Small river – fast, soft, cold;
Small river – fast, soft, warm;
Small river – slow, hard, cold;
Small river – slow, hard, warm;
Small river - slow, soft, cold;
Small river - slow, soft, warm

III. **Big rivers –**
Large river – cold, hard;
Large river – cold, soft;
Large river – warm, hard;
Large river – warm, soft

Riverine width (stream/small river/large river), temperature (cold/warm), and alkalinity (soft/hard) can be defined as follows:

Community	Width (ft)	Temperature (ºC)	Alkalinity (mg/1 as $CaCO_3$)
Stream – cold, mod/hard	<20	≤24	≥20
Stream – cold, soft	<20	≤24	<20
Stream – warm, mod/hard	<20	>24	≥20
Stream – warm, soft	<20	>24	<20
Small River – cold, mod/hard	20-40	≤24	≥20
Small River – cold, soft	20-40	≤24	<20
Small River – warm, mod/hard	20-40	>24	≥20
Small River – warm, soft	20-40	>24	<20
River – cold, mod/hard	>40	≤24	≥20
River – cold, soft	>40	≤24	<20
River – warm, mod/hard	>40	>24	≥20
River – warm, soft	>40	>24	<20

Note: Each type can be subdivided into reaches that are low gradient (<0.25% or 13 ft/mi) and moderate/high gradient (>0.25%).

LACUSTRINE

I. Spring pond
II. Ephemeral pond
III. Lake- -deep, hard, drainage
IV. Lake- -deep, hard, seepage
V. Lake- -deep, soft, drainage
VI. Lake- -deep, soft, seepage
VII. Lake- -deep, soft, seepage (sterile)
VIII. Lake- -hard bog
IX. Lake- - soft bog
X. Lake- -meromictic
XI. Lake- -shallow, hard, drainage
XII. Lake- -shallow, hard, seepage
XIII. Lake- -shallow, soft, drainage

OVERVIEW APPENDIX VIII. Quality/viability ranking criteria for natural communities

A new standard of ranking criteria has been proposed for use by the Natural Heritage Program network (The Nature Conservancy 1997). These criteria are used to rank the quality and viability of Element Occurrences (EOs, places on the ground where an occurrence of a type is found). The overall rank is called the Element Occurrence Rank (EORANK).

For the RNA Assessment we have adopted this system to rank the occurrences of natural communities on RNAs and RNA-equivalents. Because in most cases these occurrences are not Heritage Element Occurrences, we call the overall rank a **quality/viability rank**. The overall rank is an integration of 3 individually-ranked factors:

Condition + Size + Landscape context ⇒ Quality/Viability

Note: The EORank that is currently stored in Heritage databases consists solely of the Condition factor, plus a minimum size for a stand to be recorded. The revised EORank which we present here has not yet been put into practical use by the Heritage programs. Therefore if in the near future an "EORank" is obtained from a Heritage program, it must be integrated with ranks for size and landscape context in order to assign an overall rank to the occurrence.

The procedure for ranking a community occurrence is outlined below. *We recommend that ecologists wanting to rank an occurrence should contact a Heritage or Nature Conservancy ecologist in addition to reading this procedure.*

1. The ranks for the 3 factors (condition, size, and landscape context) are assigned.
2. The 3 factor ranks are equally weighted to produce the overall quality/viability occurrence rank. The weighting of each factor can be slightly increased or decreased based on knowledge that is not reflected in the 3 ranks. In particular, matrix types are weighted more by size and landscape context factors, and ranks for small patch types weighted more by condition and landscape context factors.

The ranks for the 3 factors are assigned as follows:

- **SIZE:** a measure of the quality of spatial scale as it relates to the persistence of biotic and abiotic factors, structures, and processes *within* the occurrence. *These sizes* (in acres) *are specific to this RNA assessment; see Appendix VI for justification.*

		MATRIX	LARGE PATCH	SMALL PATCH
A –	Very Large	> 5,000	> 500	> 50
B –	Large	500 - 5,000	50 - 500	5 - 50
C –	Moderate	50 - 500	5 - 50	0.5 - 5
D –	Small	< 50	< 5	< 0.5

CONDITION: an integrated measure of the quality of biotic and abiotic factors, structures, and processes *within* the occurrence, and the degree to which they affect its continued existence.

A -- Typical composition, with indicator species
Typical structure, especially of mature or old-growth features where appropriate
Few or no exotics
Presence of natural processes, including disturbances
Lack of negative human impacts

B -- Lack of some typical indicators
Structure may be somewhat immature, or lacking old-growth features, if expected
Some exotics, but not dominant
Some natural processes lacking
Some negative human impacts

C -- Many typical indicators missing; "weedy" dominants
Structure immature, or lacking features present under natural disturbance processes
Exotics may be extensive, but rarely dominant over native component.
Natural processes largely changed
Some extensive negative human impacts

D -- Most typical indicators missing; "weedy" dominants
Structure immature or lacking features present under natural disturbances
Exotics may dominate over native components
Natural processes highly altered
Extensive negative human impacts

- **LANDSCAPE CONTEXT:** an integrated measure of the quality of biotic and abiotic factors, structures, and processes *surrounding* the occurrence, and the degree to which they affect its continued existence.

A -- Highly connected; occurrence is surrounded by largely intact natural vegetation, with species interactions and natural processes occurring across communities. An area of 2,500-10,000 acres surrounding the occurrence is 80% natural vegetation.

B -- Moderately connected; occurrence is surrounded by moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality, due to overgrazing or recent logging. An area of 2,500-10,000 acres surrounding the occurrence is 50-80% natural vegetation.

C -- Moderately fragmented; occurrence is surrounded by a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; surrounded by a mix of intensive agriculture and adjacent forest lots. The area surrounding the occurrence is 20-50% natural vegetation.

D -- Highly fragmented; occurrence is entirely or almost entirely surrounded by agricultural or urban land use and is at best buffered on one side by natural communities. The area surrounding the occurrence is 0-20% natural vegetation.

OVERVIEW APPENDIX IX. National forests by province

National forests in the same province can work together to fill goals and establish priorities for the province. In particular, alliances can be prioritized by their distribution in relation to the subsection. (See section V.E. and Figure II).

Province 212—Laurentian Mixed Forest Province

Chequamegon-Nicolet
Chippewa
Hiawatha
Huron-Manistee
Ottawa
Superior
Allegheny[§]
Green Mountain[§*] & Finger Lakes[§]

Province 221—Eastern Broadleaf Forest (Oceanic) Province

Wayne
White Mountain[*]
Chattahoochee[†*]
Daniel Boone[†]
Jefferson[†*]

Province 222—Eastern Broadleaf Forest (Continental) Province

Finger Lakes
Hoosier
Huron-Manistee[*]
Mark Twain
Shawnee
Daniel Boone[†*]
Ozark[†]

Province 234—Lower Mississippi Riverine Forest Province

Mark Twain[*]
Shawnee[*]
Delta[†]
Kisatchie[†*]
Saint Francis[†]

Province 251—Prairie Parkland (Temperate) Province

Mark Twain[*]
Sheyenne National Grassland[†]

Province M212

Green Mountain
White Mountain

Province M221

Monongahela
Chattahoochee[†]
Cherokee[†]
Daniel Boone[†*]
George Washington[†]
Jefferson[†]
Nantahala[†]
Pisgah[†]

[*]Minor portions of the National Forest occur in this province.

[§]The portion of Province 212 in which these national forests occur is disjunct (in the U.S., at least) from the portion in which the other national forests in this province occur. The national forests of Province 212 may consider the province as two subregions (Lake States and Eastern) for the purposes of establishing priorities and filling goals at the province level.

[†]These national forests and grasslands are not part of the USFS Eastern Region and are not included in the Eastern Region Assessment; therefore they may not have identified the same ecosystems to represent.

OVERVIEW APPENDIX X. Research natural areas (RNAs) and their subsection(s)

Each established RNA (as of 1/99) and the subsection in which it occurs, based on Keys *et al.* 1995. LaRue-Pine Hills/Otter Pond RNA occurs in two subsections.

National Forest	RNA	Subsection
Allegheny	Tionesta	212Ga
Chequamegon-Nicolet	Bose Lake	212Jl
	Chequamegon Hardwoods	212Jb
	Grandma Lake Wetlands	212Jl
	McCarthy Lake & Cedars	212Jc
	McCaslin Mountain	212Jl
	Memorial Grove Hemlocks	212Jm
	Moquah	212Ka
	Spider Lake	212Jc
	Tucker Lake Hemlocks	212Jm
	Twin Lakes Bog	212Jf
Chippewa	Battle Point	212Na
	Clustered Bur Reed	212Nb
	Pine Point	212Nc
	Stony Point	212Na
Green Mountain	The Cape	M212Ca
Hiawatha	Dukes	212Hb
	Grand Island	212Ia
	Horseshoe Bay	212Hj
Hoosier	Pioneer Mothers Memorial Forest	222Df
Huron-Manistee	Hayes Tower	212Hp
	Newaygo Prairies	212Hu
	Nordhouse Dunes	212Hw
Ottawa	McCormick	212Jr
Shawnee	Atwood Ridge	222Aq
	Barker Bluff	222Di
	Burke Branch	222Di
	Cave Hill	222Dh
	Dennison Hollow	222Dh
	LaRue-Pine Hills/Otter Pond	222Ao, 222Aq
	Ozark Hill Prairie	222Ao
	Panther Hollow	222Dh
	Stoneface	222Dh
	Whoopie Cat Mountain	222Di
Superior	Keeley Creek	212La
	Lac La Croix	212La
	Marble Lake Lookout	212Lb
	Schroeder	212Lb
Wayne	Reas Run	221Ec
White Mountain	Alpine Gardens	M212Ad
	Nancy Brook	M212Ad
	The Bowl	M212Ad

OVERVIEW APPENDIX XI. Province-wide representation of selected alliances based on community distribution and community pattern.

For each province, a list is given of the current representation of: (1) *endemic* alliances (regardless of community pattern), and (2) *limited* alliances that are also *matrix* alliances. This information could be used in setting priorities at the Forest or Province level. Alliances may be considered of greater priority to represent on national forests within a province if the distribution of alliances is endemic or limited to the province (see Figure II). This is especially true if the alliances are important landscape components because of their community pattern (matrix). National forests in the same province can evaluate needs for RNAs in relation to current representation of these alliances province-wide.

Province 212—Laurentian Mixed Forest Province

Note: National forests occurring in the eastern part of Province 212 are geographically distant from those in the Lake States. For evaluating current province-level representation, it may be useful to consider two sub-provinces (Lake States and Eastern). In this assessment, community distribution for alliances in Province 212 was assigned primarily based on knowledge of alliances in the Lake States sub-province as there is more national forest acreage there. Community pattern was assigned differently by sub-province.

*Alliances **endemic** to Province 212 (Lake States only).*

The alliances endemic Province 212 are shown here, along with their occurrence and representation on national forest land.

		# of 212 subsections in which the alliance...	
Endemic Alliances	**National Forest**	**occurs**	**is represented**
Red Pine Forest Alliance (matrix)	Chequamegon-Nicolet	7	1
	Chippewa[1]	3	1
	Hiawatha	6	0
	Huron-Manistee	6	1
	Ottawa	6	1
	Superior	4	1
[1]Does not include the low-quality (BC- or C-ranked) occurrences on Battle Point RNA and Lost 40 SNA in 212Na and Clustered Bur Reed RNA in 212Nb; representation could change if these areas are ranked higher upon reevaluation.			
Jack Pine - (Red Pine) Wooded Herbaceous Alliance (matrix)	Chequamegon-Nicolet	2	1
	Hiawatha	3	0
	Huron-Manistee	6	0
Jack Pine - Oak (Northern Pin, Black) Forest Alliance (large patch)	Chequamegon-Nicolet	6	0
	Chippewa[2]	3	0
	Huron-Manistee	7	0
	Ottawa	5	0
[2]Does not include the low-quality (BC-ranked) occurrence on Paul Bunyan Savanna in 212Nc.			

(cont.)

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Endemic Alliances	National Forest	# of 212 subsections in which the alliance... occurs	is represented
Leatherleaf - (Bog Laurel) Seasonally Flooded Dwarf-Shrubland Alliance (large patch)	Hiawatha	7	1
	Huron-Manistee	7	0
Northern White Cedar - Yellow Birch Forest Alliance (large patch)	Chippewa	3	0
	Superior	1	0
Northern White Cedar Complex (large patch)	Hiawatha	2	1
(Jack Pine, Red Pine) Woodland Alliance (small patch)	Chequamegon-Nicolet	5	1
	Hiawatha	2	0
	Huron-Manistee	7	0
	Ottawa	2	0
	Superior[3]	1	1
[3]This alliance is represented in 212La on the Boundary Waters Canoe Area Wilderness and might also occur on Keeley Creek RNA. Its presence and extent on these areas should be verified.			
Cobble/Gravel Shore Sparse Vegetation[4] (small patch)	Chippewa	3	0
	Hiawatha	1	1
	Ottawa	1	0
	Superior	1	0
[4]The community distribution of this type may change [by what?].			
Common Juniper Shrubland Alliance (small patch)	Huron-Manistee	1	0
	Ottawa	1	0

*Alliances **limited** to the Lake States portion of Province 212 (**matrix** alliances only)*

Limited alliances are common or somewhat-common in the Province and also occur in one to several other Provinces.

Limited matrix Alliances	National Forest	# of 212 subsections in which the alliance... occurs	is represented
Eastern Hemlock - Yellow Birch Forest Alliance[5]	Chequamegon-Nicolet	8	2
	Hiawatha	2	0
	Huron-Manistee	5	0
	Ottawa	8	3
	(Allegheny)	1	1
[5]This alliance occurs in Province 212 on the Finger Lakes and Green Mountain National Forests, but it is not considered to be a matrix alliance on these Forests.			
Eastern Hemlock Forest Alliance	Chequamegon-Nicolet	4	2
	Hiawatha	1	0
	Ottawa	7	3
White Pine - Eastern Hemlock Forest Alliance[6]	Chequamegon-Nicolet	7	0
	Hiawatha	7	1
	Huron-Manistee	3	0
	Ottawa	7	0
	(Allegheny)	1	0
[6]This alliance occurs in Province 212 on the Green Mountain National Forests, but it is not considered to be a matrix alliance on this Forest.			

(cont.)

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Limited matrix Alliances	National Forest	# of 212 subsections in which the alliance... occurs	is represented
White Pine - (Red Pine) - Quaking Aspen Forest Alliance	Chequamegon-Nicolet	3	0
	Chippewa	3	0
	Huron-Manistee	2	0
	Ottawa	6	0
	Superior	3	1
White Pine Forest Alliance[7]	Chequamegon-Nicolet	7	1
	Chippewa	3	0
	Hiawatha	2	0
	Huron-Manistee	10	0
	Ottawa	6	2
	Superior	4	1

[7]This alliance occurs in Province 212 on the Green Mountain National Forests, but it is not considered to be a matrix alliance in the east.

Province 221—Eastern Broadleaf Forest (Oceanic) Province

Assessment results for the White Mountain National Forest are not complete enough to specify whether there are endemic or limited alliances occurring on the Forest.

*Alliances **endemic** to Province 221.*

No alliances currently reported to occur on the Wayne National Forest are **endemic** to Province 221.

*Alliances **limited** to Province 221 (**matrix** only)*

Limited alliances are common to somewhat-common in the Province and also occur in one to several other Provinces.

Limited matrix Alliances	National Forest	# of 221 subsections in which the alliance... occurs	is represented
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Wayne	3	0
Tuliptree - Appalachian Basswood - Yellow Buckeye – Sugar Maple Forest Alliance	Wayne	3	1

Province 222—Eastern Broadleaf Forest (Continental) Province

*Alliances **endemic** to Province 222*

The alliances endemic to Province 222 are shown here, along with their occurrence and representation on national forest land. These alliances may be a high priority to represent in the subsections in which they occur, because there is little or no opportunity for representation outside the Province.

		# of 222 subsections in which the alliance...	
Endemic Alliances	**National Forest**	**occurs**	**is represented**
Post Oak Flatwoods Forest Alliance (large patch)	Mark Twain	1	0
Little Bluestem - Oatgrass species Evergreen or Mixed Wooded Herbaceous Alliance (small patch)	Hoosier	1	1
	Shawnee	3	2

*Alliances **limited** to Province 222 (**matrix** alliances only)*

Limited alliances are common to somewhat-common in the Province and also occur in one to several other Provinces.

		# of 222 subsections in which the alliance...	
Limited matrix Alliances	**National Forest**	**occurs**	**is represented**
American Beech - Sugar Maple - (Tuliptree) Forest Alliance	Finger Lakes	1	0
	Hoosier	3	2
	Shawnee	8	3

Province 234—Lower Mississippi Riverine Forest Province

Alliance pattern and distribution information was not assigned to alliances within this province. No alliance information was compiled for the subsections in this province, as minor portions of USDA Forest Service Eastern Region national forests occur in this province.

Province 251—Prairie Parkland (Temperate) Province

Alliance pattern and distribution information was not assigned to alliances within this province. No alliance information was compiled for the subsections in this province, as minor portions of USDA Forest Service Eastern Region national forests occur in this province.

Province M212—New England-Adirondack Province

Alliances are not listed for the White Mountain and Green Mountain National Forests because the assessments are preliminary for these two Forests. Data are insufficient to specify whether there are endemic or limited alliances occurring on either Forest.

Province M221—Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow Province

Alliances are not listed for the Monongahela National Forest because the assessment is preliminary for this Forest. Insufficient data are included in this assessment to specify whether there are endemic or limited alliances occurring on the Forest.

OVERVIEW APPENDIX XII. Size distribution information for alliances based on pre-European settlement information

One way to judge the functional/historic range of sizes for an alliance is to look at its community pattern. Each alliance is placed in one of three classes: matrix, large patch, or small patch (see National Vegetation Classification in section V.B.). For each class we assigned some coarse-scale acreage values for what we would consider a "Small", "Moderate", "Large", or "Very Large" occurrence of an alliance in that class. Thus, for matrix alliances, "Small" occurrences are <50 acres while "Very Large" occurrences are ≥ 5,000 acres; for large patch alliances, "Small" occurrences < 5 acres and "Very Large" occurrences are ≥ 5,000 acres; for small patch alliances, "Small" occurrences are < 0.5 acre and "Very Large" occurrences are ≥ 50 acres. Occurrences of alliances on RNAs or RNA-equivalents are placed into these categories.

We assessed the accuracy of these scales by looking at the patch sizes of alliances or groups of alliances on pre-European settlement (hereafter called presettlement) community maps. We did this analysis in the Lake States (Minnesota, Wisconsin, and Michigan) because the maps are available in digital form. The presettlement community types were classified by the mappers (Marschner 1974, Finley 1976, Comer *et al.* 1996) using Land Survey data taken in the late 1800s.

We first produced a crosswalk between the community types identified on the presettlement maps and the alliances identified in the national classification. We then assigned the presettlement community types to the most appropriate class of community pattern, whether matrix, large patch or small patch. No small patch presettlement types were mapped because the scale was too small.

Using ArcInfo, we calculated the acreage of each polygon for each presettlement community type and assigned each polygon to the size classes summarized above and given in the table below. This information helped us to verify that alliances had been assigned to the correct community pattern category and to determine whether they are currently protected on RNAs or RNA-equivalents at a range of sizes appropriate for their pattern. The accuracy of this information is dependent on the quality of the fit between a presettlement community type and an alliance, and the level of detail of patch-delineation during mapping.

An illustration of the findings of this analysis is given below for presettlement types in northern Minnesota. The tables show that the presettlement types can be related to alliance types and that these presettlement types span a range of size classes expected for their pattern.

Number of patches of Marschner presettlement community types in 4 size ranges. Only patches in Province 212 in Minnesota are tallied. Acreage of each presettlement type is scaled based on the community pattern of the alliance. For example, a "Large" occurrence of a large patch type is 50 - 499 acres.

	# of digitized patches in size class			
	Small	**Moderate**	**Large**	**V. Large**
Matrix Communities	**< 50**	**< 50-499**	**500-4,999**	**≥ 5,000**
White Pine	5	36	25	4
White and Norway pine	33	425	235	46
Jack pine barrens and openings	30	310	200	46
Big Woods (Upland hardwood forest)	13	174	100	21
Aspen-Birch-(Hardwoods)	11	82	44	7
Aspen-Birch-(Conifer)	80	753	531	118
Large Patch Communities	**< 5**	**< 5-49**	**50-499**	**≥ 500**
Conifer bogs & swamps (Spruce, tamarack, cedar, balsam)	9	171	1,772	1,577
Aspen-Oak Land	0	5	77	34
River-Bottom Forest	1	6	47	48
Mixed Hardwood & Pine	2	20	181	145
Oak openings and barrens	0	6	29	28
Wet Prairies, Marshes and Sloughs	0	41	400	328
Open muskeg (Floating bog)	0	1	12	12

Relationship of Marschner presettlement community types to alliances. A status of ">" indicates that the alliance is related to more than one Marschner type.

Marschner Community Type	Alliance	Status
Aspen-Birch-(Conifer)	Northern White Cedar - Yellow Birch Forest	
	Northern White Cedar Forest	
	Quaking Aspen - Paper Birch Forest	
	White Pine - (Red Pine) - Quaking Aspen Forest	?
	White Spruce - Balsam Fir - Aspen Forest	?
	White Spruce - Balsam Fir Forest	>
Aspen-Birch-(Hardwoods)	Quaking Aspen - Paper Birch Forest	>
Aspen-Oak Land	Quaking Aspen Forest	
Big Woods (Upland hardwood forest)	Green Ash - (American Elm) Forest	
	Red Oak - Sugar Maple - (White Oak) Forest	
	Sugar Maple - American Basswood - (Red Oak) Forest	
	Sugar Maple - Yellow Birch - (American Beech) Forest	
	White Oak - (Red Oak, Hickory) Forest	
Conifer bogs & swamps (Spruce, tamarack, cedar, balsam)	Black Spruce Saturated Woodland	
	Red Maple - Green Ash Seasonally Flooded Forest	
	Black Ash - Red Maple Saturated Forest	
	Black Spruce Saturated Forest	
	Northern White Cedar Saturated Forest	
	Tamarack Saturated Forest	
Jack pine barrens and Openings	Jack Pine Forest	
	Jack Pine - (Red Pine) Wooded Herbaceous	
	Jack Pine - Oak (Northern Pin, Black) Forest	
	Black Spruce Forest	
Mixed Hardwood & Pine	White Pine - Oak (White, Red, Black) Forest	
Oak openings and barrens	Bur Oak – Oak (White, Black) Woodland	
	Bur Oak Woodland	
	Black Oak - (Northern Pin Oak) Wooded Herbaceous	
	Black Oak - Northern Pin Oak Forest	
Open muskeg (Floating bog)	Bog Birch - (Willow) Saturated Shrubland	
	Wiregrass Sedge Saturated Herbaceous	
	Few-seeded Sedge - Wiregrass Sedge Saturated Herbaceous	
	Sedge Saturated Herbaceous	
	Leatherleaf Saturated Dwarf-shrubland	
Pine flats (Hemlock, spruce, fir, cedar, white pine)	White Pine Forest	>
Prairie	Little Bluestem - Indian Grass Herbaceous	
River-Bottom Forest	Silver Maple Temporarily Flooded Forest	
	Green Ash - American Elm - (Hackberry, Sugarberry) Temp. Flooded Forest	
Wet Prairies, Marshes and Sloughs	Swamp Cabbage - Marsh Marigold Saturated Herbaceous	
	Prairie Cordgrass Temporarily Flooded Herbaceous	
	Cattail (Narrowleaf, Common) - (Bulrush) Semiperm. Flooded Herbaceous	
	Red Osier Dogwood - Willow Seasonally Flooded Shrubland	
	Lake Sedge Seasonally Flooded Herbaceous	
	Speckled Alder Seasonally Flooded Shrubland	
White and Norway pine	White Pine Forest	>
	Red Pine Forest	
White Pine	White Pine Forest	>

GLOSSARY QUICK LIST [INSIDE BACK COVER]

Some of the most frequently used terms whose meanings are important to the use of this document. For expanded explanations and citations related to these terms, refer to the Glossary.

Alliance: A level of the National Vegetation Classification of *existing* vegetation. An alliance is a terrestrial plant community that is distinguished from other alliances by dominant or diagnostic species found in the canopy layer. The concept of an alliance is similar to a "cover type." A cover type includes one or more alliances when the dominant species are widespread over varied environmental conditions.

Ecosystems to Represent: In the Regional RNA Framework, the ecosystems to represent means each ALLIANCE in each SUBSECTION that occurs on national forest land. The ecosystems to represent can be seen as cells in a table (matrix) of alliances by subsections, and can be referred to as alliance-subsection combinations. Collectively, these ecosystems across all national forests comprise the units to be represented in the network of REPRESENTATIVE RNAs for the Eastern Region.

Ecological Unit: A generic term for a mappable land unit at any level of the National Hierarchy of Ecological Units, e.g., PROVINCE, SUBSECTION, LANDTYPE ASSOCIATION. Ecological units are distinguished by abiotic and biotic characteristics, including climate, geological parent materials, landforms, local topography and aspect, soils, and potential natural vegetation.

Level I Protection: A highly protected area "maintained in its natural state with an active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference". A level of protection at least as high as that of an RNA.

Natural Community: A plant community dominated by native species and natural processes. Distinct from *cultural landcover*, which is cultivated vegetation or human-made structures.

Protected: Managed to minimize modification by humans; maintained permanently in a natural state.

Quality/Viability: Refers to the degree to which a community occurrence contains typical species and processes of the community, and the probability that it will be in good condition into the future. Integrates the condition, size, and landscape context of an occurrence. A "HIGH-QUALITY" occurrence is A- or B-ranked, and a "LOW-QUALITY" occurrence is BC- or C-ranked.

Represent: To serve as a typical example of an ecosystem. Specifically, an alliance-subsection combination is *represented* if there is an A- or B-ranked OCCURRENCE of the alliance in the subsection on an RNA or RNA-equivalent that can serve as a baseline for comparison to manipulated versions of the same ecosystem type.

Representative RNA: An RNA that can serve as a control or reference area for one or more community types in an ecological unit (*e.g.*, a subsection). It REPRESENTS the community types in the subsection. *Representative* is used in the sense of "typical example". Representative RNAs form a network of examples of ecosystems found on Forest Service lands

RNA: Research Natural Area.

RNA-equivalent: An area other than an RNA that can serves the same purpose as a REPRESENTATIVE RNA (reference area). To qualify, an area must be a "LEVEL I" protected area "maintained in its natural state with an active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference." Preserves of The Nature Conservancy and State Natural Areas are examples of RNA-equivalents.

Subsection: A level of The National Hierarchy of Ecological Units (Table I). A subsection is a land unit equivalent to a major landform of 10s to 1,000s of square miles, distinguished from other subsections by surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities.

Target : A representational goal for a network of RNAs using Society of American Foresters (SAF) cover types, according to the 1986 Eastern Regional Guide.